Journal and Proceedings

OF THE

Hamilton Scientific Association

FOR SESSION OF 1899-1900.

NUMBER XVI.

CONTENTS.

AUTHORS OF PAPERS ARE ALONE RESPONSIBLE FOR STATEMENTS MADE AND OPINIONS EXPRESSED THEREIN.

PRINTED FOR THE HAMILTON ASSOCIATION BY THE SPECTATOR PRINTING COMPANY.

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1899—W. H. Elliott, B. A.; Robt. Campbell; W. A. Childs, M. A.; Wm. C. Herriman, M. D.; W. A. Robinson.

ABSTRACT OF MINUTES

OF THE PROCEEDINGS OF THE

Hamilton Association

DURING THE

SESSION OF 1899-1900.

THURSDAY, NOVEMBER 9th, 1899.

OPENING MEETING.

The President, Thos. W. Reynolds, M. D., was in the chair.

After thanking the Association for the honor of being re-elected President of the Association, the President delivered his inaugural address, in which was set forth the historical parallelism in the development of national Literature with the development of Architecture and Art.

At the conclusion of the President's address, the meeting was given over to an informal display of the work of the various sections.

A choice musical programme was rendered through the kindness of J. E. P. Aldous, B. A.

Attendance for the evening about three hundred.

THURSDAY, DECEMBER 7th, 1899.

The President, Thos. W. Reynolds, M. D., in the chair.

The minutes of the previous meeting were read and confirmed.

The Corresponding Secretary reported the receipt of a number of exchanges.

It was resolved that the congratulations of this Association be extended to the Canadian Institute on the occasion of their centenial celebration.

A vote of condolence was passed to the family of the late Sir William Dawson. In moving this resolution, Col. C. C. Grant spoke feelingly of the loss sustained by science through Sir William Dawson's death, and paid a deserved eulogy to his high moral character and scholarship.

Dr. A. W. Stratton, President of Lahore University, India, a former officer of the Association, was elected an honorary member.

J. A Paterson, Esq , Ex-President of the Toronto Astronomical Society then read a very instructive paper on the Darwinian Theory of the Tides, giving a scientific exposition of the subject and explaining by means of blackboard illustrations the effects of the lunar and solar attractions. The tidal phenomena, he said, involves the origin and history of not only our own solar system, but that on which other planets depend. He explained by mathematical illustrations how the lunar attraction was stronger than the solar, and that the tide rising effect varies as the cube of the distance from the moon to the earth. The Darwinian theory predicts that the sun and moon will eventually move as a solid bar, and that there will be no lunar tides. The solar tide will gradually retard the earth's rotation and the moon will be attracted to the earth and ultimately fall into.

The subject was warmly discussed by the members and a hearty vote of thanks was tendered the speaker of the evening.

THURSDAY, FEBRUARY 15th, 1900.

President, Thos. W. Reynolds, M. D., was in the chair.

Minutes of the last regular meeting were read and confirmed.

An application for membership was read from Geo. L. Johnston, B. A.

The President introduced to the Association John W. Crerar, Esq., Q. C., who read an able paper entitled "Money as a Factor in Trade and Commerce."

Mr. Crerar began by stating that he felt some hesitation in selecting this particular subject, because it constituted a branch of political economy, and in his experience political economy in Canada was generally regarded as a branch of party politics, and on that account was practically tabooed from popular discussion. It always appeared anamolous to him that while astronomy, chemistry, geology or even theology—the most fruitful of all acrimonious argument—were considered scientific subjects, political economy, taught in all our colleges and universities as a science, was deemed objectionable in the conversation of social intellectual life, because it involved party politics. He hoped his hearers were not such slaves to any political party as to be incapable of considerlng this branch of political economy, as a branch of a science based upon immutable principles.

The lecturer then entered into his subject, and defined money as that portion of the world's accummulated wealth abstracted from productive capital, and set apart as an agent to facilitate barter. Money was an expensive machine kindred to weights and measures in utility, although infinitely more expensive. The metallic money of the world amounted to something like $8 per head of the population of the civilized human race, and that enormous sum was abstracted from the world's capital for the mechanical purpose of making the residue more productive. He then traced the history of money. Its origin could only be conjectured. its necessity arose when the introduction of the division of labor had stimulated production into a vast variety of products. Barter became an impossibility. Without some common measure of value by reference to which the exchange value of all products was expressed, the relative value of one product with another became impossible.

An immense number of individual products had been chosen for this common standard. Skins, cattle, corn, oil, shells and even wrought straw, had been selected as a common standard. A standard of value need not necessarily be any material object. A mere name, as a mental calculus, was sufficient. But the common standard of value was not enough to render barter practicable. A medium of exchange was found necessary. As ultimately the precious metals were selected as the common standard these were found from their

inherent qualities of durability and fixity of inherent value best suited for a medium. Gold or silver—sometimes one, sometimes the other, never both at the same time in the same locality—were first chosen as a standard of value and as a medium of exchange, and when coined into pieces with the state's mark affixed to warrant the weight and degree of fineness, this medium was called money.

Mr. Crerar then referred to the distinction between international and national, or domestic money. The former was used in commerce ; the latter in trade. Thirty years ago it required $17 to effect the exchange in money—to effect the exchange of $100 worth of produce between nation and nation. To-day probably not more than $2 was used for that purpose. The ocean cables, fast sailing steam vessels, extended telegraphic and telephonic systems, had effected an enormous saving in the waste of capital consisting of the precious metals devoted to the purpose of facilitating barter between nation and nation. In trade, statistics showed precisely what money was used to facilitate domestic barter. France had the largest per capita volume of domestic money in the world, and Canada, excepting China and India, whose dense populations were exceptional, had the smallest. Nevertheless, the Canadian currency, with its domestic money constantly in use, was ample and was as safe as the currency of England. If the currency system were adopted by all of the trading and industrial nations, thousands of millions of dollars of the world's surplus wealth now playing the part of a machine to facilitate barter would be released and restored to productive purposes.

The popular notion is that the circulation of money stimulates trade. Money makes the mare go. This is a fallacy, Mr. Crerar contended. Trade make money circulate. The circulation of money is an effect, not a cause. A united effort by the government and the banks to increase the amount of money in circulation would prove abortive. The greatest expansion in the volume of Canadian currency is in the month of November ; its lowest contraction is in May. Neither the banks nor parliament could turn that around and reverse the May and November conditions. Similarly, there is no power to increase the Canadian currency from $9.50 a head of our population to $15 a head as in England As well expect the corner

grocer to add to his sales by increasing his weights and measures. As trade expands the currency expands, and conversely.

The lecturer then referred to a great many fallacies regarding the economic laws governing trade and commerce, owing to the popular errors regarding the functions of money. For example it was popularly supposed that the most profitable commerce was that which produced a large surplus of exports over imports. Mulhall points out how imports must necessarily exceed exports in value, because the former cover the costs of freight and insurance upon the latter, which until very recently amounted to about 6 per cent. The popular delusion is that when exports exceed imports the difference is brought back in money, as if there were some special advantage in that brand of labor product which consisted of metallic pieces of a given weight, shape and diameter. If money was a mere machine to facilitate barter, like weights and measures, the tape line or the yard stick, as undoubtedly it was, and nothing else (except perhaps to be stored away, like precious stones as unproductive but undiminishing capital), how could it be a desirable thing to import in exchange for labor products exported? As a matter of fact, it never is.

The commerce of the world does not involve the export or import of money to the extent of 2 per cent of its value. If, said Mr. Crerar, he had shown that all trade consisted of barter, how in the nature of things could the exports exceed the imports? Eliminate money from the computations, and deal with the exports and imports as products other than money, (as the fact is, when the full exchange is completed), and how would the excess of exports over imports be shown? If it be true that an excess (in money value) of imports over exports represents a debt due by the over-importing country to the exporting country, then statistics present this curious anomaly. Taking Mulhall's commerce statistics for 30 years up to 1890, the speaker divided the commercial world into two groups: Those nations that exported more than they imported during the period, and those that imported more than they exported. The sum total represented the gross commerce of the commercial world. He then showed that the grand total of the excess of imports over the exports by the debtor, the over-importing nations, which owed the

difference to these nations which exported more than they imported, because there were no other conceivable creditors, and also the balance which the over-exporting nations had accumulated in their favor during the same period.

After paying the creditor nations all they claimed to balance their trade, the debtor or over-importing nations were left with something like sixteen thousand million dollars of indebtedness; the balance was still against them for that sum on the 30 years foreign business—with no nations left to claim it. Mr. Crerar remarked that he was open to be better instructed on this particular branch of his subject and if his methods of drawing these deductions from figures was erroneous—and he was free to admit that the method was strictly his own and would not be found in any treatise—he would be glad to be corrected.

Mr. Crerar then wound up with a number of references to popular fallacies about the supposed special power and wealth in the form of money as distinct from other wealth of equal value, and urged his audience when considering the great problem of developing trade and commerce, and in drawing inferences from its varying volume, to eliminate utterly the idea of money in a material form as a factor to be considered. All trade consists of barter, the same today as before the flood, and will consist of barter while the industrial world endures.

On motion of A. Alexander a vote of thanks was heartily accorded to Mr. Crerar.

THURSDAY, MARCH 15th, 1900.

Vice-President, J. M. Dickson, was in the chair.

Minutes of the previous meeting were read and confirmed.

Geo. L. Johnston, B. A., was elected a member of the Association.

The programme of the evening was then proceeded with, the first paper being read by Mrs. Rose Holden and entitled "La Guerre des Iroquois."

This paper contained a great amount of valuable memoranda concerning the troubles of the early Indian tribes. Mrs. Holden en-

tertainingly sketched the history of the early struggle of the Iroquois against the Algonquins, Hurons and the French.

She also entered extensively into the struggle of the Iroquois with the Eries, which culminated in the complete absorption of the latter tribe. The tribes of the neutral confederacy, of which the Eries were the chief and most numerous, were settled in this part of Ontario, and in 1616 numbered 39 villages, 4,000 warriors, and about 12,000 souls in all, and had 12 strongly fortified places, the most important being Buffalo.

The Eries were the custodians of the national pipe of peace, which was lighted by their Queen, the great Mother of the Nations. They were the only Indian Confederacy ever governed by a woman. The paper concluded by tracing the origin and course of the war of the Iroquois against the neutral confederacy, which ultimately resulted in the annihilation of the tribe of the Eries.

The next paper was read by Mr. C. R. McCulloch and was written by Mr. Arthur Heming. It was entitled "The Last Fur Brigade" In a vivid descriptive manner, the writer sketched the picturesque trip of the only remaining voyaguers of the Hudson Bay Company, of the Abitibi in the Ottawa river district.

Another of Mr. Heming's interesting papers was read by Mr. McCulloch, entitled "The Riders of the Plains," It was a well written article on Canada's famous body of Northwest mounted police, a body of men who owing to their valor and impartiality and by their hardihood and discretion have won the reputation of being the finest organization of the kind in the world. They are called upon to patrol an area covering 1,000 miles from east to west, and 2,000 from north to south. The spirit of cordiality existing between the police and the settlers enables this handful of men to enforce order over a tract of country three quarters the area of Russia.

Mr. Heming enumerated many stirring experiences in the history of the force, and concluded by paying a glowing tribute to the value of the corps, and commented on the fact that the country over which they exercise jurisdiction has never, since the organization of the corps, had a lynching or a train robbery.

The last paper was read by the recording secretary and gave a

brief and interesting account of the Iroquois Ceremonial of Name Giving. It was written by Mr. J. O. Brant Sero.

THURSDAY, APRIL 5th, 1900.

President Thos. W. Reynolds, M. D., occupied the chair.

Minutes of the last meeting were read and confirmed.

Dr. T. W. J. Burgess was appointed to represent the Association at the coming meeting of The Royal Society of Canada.

The Corresponding Secretary reported the receipt of a number of exchanges.

Dr. R. Bruce Smith then read an interesting paper on the subject of Religion and Insanity.

The paper entered into a careful and learned exposition of many cases of insanity supposed to have been caused by the influence of religious ideals. In these cases it was shown that dogma rather than religion was at the base of the fault, and that in all cases of insanity there must, moreover, be some primary defect in the nervous organism.

An interesting discussion followed.

THURSDAY, APRIL 19th, 1900.

A special meeting of the Association was held with President Thos. W. Reynolds, M. D., occupying the chair.

Rev. J. L. Gilmore, B. D., was introduced to the Association, and read an interesting and instructive paper on the Theology of Plato's Republic. The sources from which the subject was derived were, said Mr. Gilmour, nature, science, human nature and emotions. The essayist divided the subject into five parts, dealing with each separately. These were God, man, sin, salvation and the future.

At the conclusion of the paper a general discussion took place and was participated in by a number of the members.

Wm. C. Herriman, M. D., read a series of Natural History Notes from Mr. Wm. Yates, of Hatchley, which were written in Mr. Yates' usual interesting and instructive style.

THURSDAY, MAY 3rd, 1900.

President Thos. W. Reynolds, M. D., in the chair.

Minutes of the last regular and of the subsequent special meetings were read and confirmed.

Dr. James Russell then read an instructive and thoughtful paper on the subject "Is the Anglo-Saxon Race Degenerating?"

The subjeet was one, the doctor thought, that would bear investigation if for nothing else than to discover what our racial assets were and whether or not there may be an extravagant waste of brain energy which was leading on to mental bankruptcy. The great cosmic forces in operation, as exhibited in the intense intellectuality of the age, manifested in the fierce struggle for national supremacy, the competition among great powers in opening up and taking possession of the waste places of the earth, the subjugation of the weak by the strong, the formation of great corporations and trusts in place of individualism, the intense struggle for wealth and power, the wide diffusion among the masses, the wealth of discovery and invention, the wonderful provision for the weak and degenerate classes as evidencing the altruistic spirit of the age, all these symbolized as never before in the world's history, the mighty expansion of brain power. It was not to be wondered at, that the great masses of the people were unprepared for such an upheaval, and that a large number of the more weakly endowed mentally would swell the ranks of the dependent and degenerate classes.

Continuing the paper dealt with race evolution, referring specially to the progress of the Anglo-Saxon race from the barbarism of 2,000 years ago to the civilization of to-day, the greatest the world has ever known. The lessons of history taught that all the nations of history of which we have any authentic record began to crumble and decay at the very time they reached the zenith of their power and glory, and further, that a proud imperialistic spirit and lust of empire were the immediate forerunners of national dissolution. It was significant to note that there was manifest to-day a growing imperialistic idea in every branch of the Anglo-Saxon race. It was to be hoped that the imperialistic spirit of to-day, chastened and purified by the experience of the past, would prove the harbinger of peace among the nations of the earth. After referring to the causes which led to the decline

of the Roman empire, the doctor pointed out that the Anglo-Saxons had an advantage over the Romans of fifteen centuries of nation building, and greater progress in the art of constitutional government and in the extension of the rights of citizenship.

Discussing the Christian phase of citizenship, the doctor thought this one of the strongest bulwarks of Anglo-Saxon national life. Ancient Empires had their national aspirations, based on a cold and lifeless philosophy, directed to a mode of life conducive to the welfare of the individual, whereas the philosophy of Christ taught the relation of the individual to the community. Civilization was not a matter of mechanical acquirement, but requires many generations to effect a permanent modification of character. Evidence of this was seen in abortive attempts to engraft a 19th century civilization on heathen races. This was the reason there was a race problem in America. The colored race could only be civilized by a long process of evolution.

In the church worship of to-day, the sentimental and emotional sides of human nature were appealed to rather than the spiritual and intellectual, and yet at no time was there ever a broader spirit of humanity abroad than at present. There could be no doubt but that Christian teaching, imperfect though it might be, was the foundation on which the whole future of modern civilization rests.

The literature of a race was a fair criterion of the nation's intellectual vigor, and the Anglo-Saxon race had exceeded all others in the wealth of its literature. The advance in literature, art and science had worked such changes in the world as to overcome the masses, and the harvest of incapables was necessarily large. "We try," said the doctor, "to explain the large increases in our insanity returns by our larger humanity and the ampler provision made for their care, but the mighty upheaval in our social and industrial conditions must be credited with a large and ever-increasing proportion of it."

From the Elizabethan period downward, the pages of English literature had been adorned with the names of men who had made a profound impression on the age in which they lived in moulding the character and habits of the people. John Ruskin's death removed the last of these, and they left no successors, nor does there

appear to be any demand for them. This was an age of literary dissipation. Ninety per cent. of the literature of to-day was fiction, and a good deal of it of a low and impure order. People had no time for deep reading or profound thinking. The mad struggle was for wealth.

After condemning the monopolistic spirit of the age and its many evils as tending to the degeneracy of the race, the paper concluded with the statement that Anglo-Saxon national life would have constantly to be purged and purified of disease if it was to be kept from decay.

"Natural History Notes," from Mr. William Yates, were also read.

The annual meeting was then held, and the following reports were read and adopted:

Report of the Council, by the Secretary.
" " Curator, by Alex. Gaviller.
" " Geological Section, by A. T. Neill.
" " Biological Section, by A. Alexander.
" " Photographic Section, by D. Souter.
" " Corresponding Secretary, by Thos. S. Morris.
" " Treasurer, by P. L. Scriven.

The following officers were elected for the ensuing year:

President, - -	S. A. Morgan, B. A., D. Paed.
First Vice-President, -	J. M. Dixon.
Second Vice- President,	Dr. Herriman.
Corresponding Secretary,	Thos. S. Morris.
Recording Secretary, -	G. L. Johnston, B. A.
Treasurer, - -	P. L. Scriven.
Librarian and Curator, -	A. Gaviller.
Assistant Librarian, -	J. Schuler.
Auditors, - -	F. Hansel and H. S. Moore.

Council: R. Campbell, Geo. Black, J. F. Ballard, W. A. Childs, M. A., J. H. Long, M. A., LL. B.

REPORT OF THE COUNCIL.

Your Council take pleasure in submitting their report for the session of 1899-1900.

The present session has been a most successful one. The attendance at the meetings has been satisfactory, while the superior character of the work of former years has been fully maintained.

Since our last report, there have been held four meetings of the Council and seven of the general Association, at which the following papers were read and discussed:

1899.

Nov. 9th—"Inaugural Address"—President T. W. Reynolds, M. D.

Dec. 7th—"Darwinian Theory of the Tides"—J. A. Patterson, Esq., M. A., 1900.

Feb. 15th—"Money as a Factor in Trade and Commerce"—John Crerar, Q. C.

March 15th—"La Guerre des Iroquois"—Mrs. Rose Holden.

March 15th—"The Last Brigade" and "The Riders of the Plains"—Arthur Heming, Esq.

March 15th—"Iroquois Ceremonial of Name Giving"—J. O. Brant Sero.

April 5th—"Religion and Insanity"—R. Bruce Smith, M. D.

April 19th—"Theology of Plato's Republic"—Rev. J. L. Gilmour, Ph. B.

April 19th—"Biological Notes"—William Yates, Esq.

May 3rd—"Is the Anglo-Saxon Race Degenerating?"—Jas. Russell, M. D.

May 3rd—"Natural History Notes"—Wm. Yates, Esq.

Dr. J. W. L. Burgess, F. R. S. C., has been appointed to represent this Association at the coming meeting of the Royal Society.

Your Council are pleased to report an increased interest in our Museum among the citizens generally, and more particularly among the students of the City Schools and Colleges, as evidenced by the large number of visitors who avail themselves of the privilege of inspecting the same each Saturday afternoon during the session.

During the session the Council have been in communication with the civic authorities with a view of securing at Dundurn, suitable quarters for the establishment of a Public Museum. Our negotiations, however, are not yet in such shape as to warrant us in making a formal report thereon.

During the year, we, in company with many other Scientific Associations, have had to mourn the loss of a valued member in our distinguished honorary member, Sir Wm. Dawson.

We have had much pleasure in electing to honorary membership, one of our former active workers, Dr. A. W. Stratton, of Lahore University, India.

In conclusion, we would urge on the officers and members generally, the duty of applying themselves actively during the coming recess to the work of their several departments, that each may return with some new problem as material for the coming session.

All of which is respectfully submitted.

THOS. WM. REYNOLDS,
President.

S. A. MORGAN,
Secretary.

INAUGURAL ADDRESS.

DELIVERED BY T. W. REYNOLDS, M. D., PRESIDENT,
NOVEMBER 9TH, 1899.

Ladies and Gentlemen:

As President of the Hamilton Scientific Association it is my main duty now, strictly speaking, to call the members together with a view to considering how we can best carry on our work this winter.

At the same time, though, it is my privilege to extend to our visitors a hearty welcome to our headquarters, not only on this occasion, but at all other meetings. There are, however, certain obligations incumbent upon me of which the first is to thank you most sincerely for the consideration you have shown me in extending, as you have already done to my predecessors, a second term as your President. Another obligation is that of preparing and presenting an acceptable Inaugural Address. As last year I spoke of our Association's history and its objects, and dwelt particularly upon the value of devoting our spare time to work such as that carried on by our Scientific Sections, I think it would be as well this year to take up another branch.

I propose therefore, to devote my remarks to a consideration of some lines of thought in connection with our Literary work.

This might be taken up in many ways, and as the professional work of a man is liable to influence his fads, I might naturally look at Literature from a medical standpoint, and dilate on its value as a food or a medicine. For although I must admit that I have not reached that point of culture attained by the man who said that when he was low-spirited he always found refreshment in Browning, still, I think that for different mental conditions there is much benefit to be derived from various books, even if we exclude religious ones. Birrell in one of his essays, says that "Literature exists to please—to lighten the burden of men's lives; to make them for a short while forget their sorrows and their sins, their silenced hearths, their dis-

appointed hopes, their grim futures—and those men of letters are the best loved who have performed literature's truest office."

And here I might use an illustration from Physiology. One of the peculiar properties of the digestive system is its power of rendering tainted food, harmless, but in time, food of that kind will produce dyspepsia. So also it might be said of unfit literature, a healthy mind can make a proper use of it for a time, but even the most healthy is liable to give way at last. In a lecture I heard last summer by Prof. Griggs, of the Leland-Stanford University on the "Art of Living," he said that some nations it is said, can live on Arsenic, but it is a peculiar taste, and some people also could live on lies. So also might it be said of some classes of literature, Charlotte Bronte in speaking of some French novels, remarked, "They leave such a bad taste in my mouth," and like her, I would say it is not only far pleasanter, but also more profitable to read those books that do not strain the literary taste.

However, I would prefer now to offer some suggestions from a standpoint other than that of my own profession, although I might be pardoned I trust, if I borrowed a line of reasoning from it.

I refer to the fact that students of human anatomy and physiology find their investigations much assisted by studies in comparative anatomy, or that of other animals and even plants.

So then to-night, I wish to point out some lines of study that I think might well be conducted as aids to the study of Literature on account of the parallelism of their development and growth.

This parallelism is, I think, especially noticeable in the Architecture and Art of a country, for they are all three closely associated.

When we begin to trace the history of a nation or nations, we cannot but be impressed by the fact that man early found the necessity for Art and also the pressing need of Literature, for unable by his own individual powers to overcome the beasts to which he was born mentally superior, he found himself obliged to communicate with his fellows by other method than that of speech or gesture.

The method therefore adopted was primarily that of hieroglyphics, which were at first pictures, probably of animals conquered in the chase, or to be avoided, as well as of other objects constantly brought to their notice. Each of these pictures became in time corrupted, certain prominent lines taking the place of the whole and

being gradually more and more corrupted and reduced in form, although not in significance, till finally alphabets were formed. This primary use of pictures for signs though thus in time replaced, as far as ordinary purposes of communication were concerned, was by no means abandoned and much curious, interesting and withal beautiful literature is associated with the meanings attached to these emblems. For instance, look at the use made by the ancient prophets and teachers both before and after the Christian era, of various animals, many of them fabulous, such as the siren, the phoenix and the unicorn, to teach various doctrines and mysteries. Similar fables and superstitions were connected with various precious stones, while even to this day the language of flowers is by no means forgotten.

But the great evidence of the parallelism of Literature and Art is derived from their constant association, for although in the ancient monuments of the Egyptians the inscriptions ceased in time to be hieroglyphical, yet they are generally associated with pictures or sculptures forming what might be designated the first known use of illustrations. From that time though, it became constant and we might well say that in transmitting information, when it is intended to be conveyed to the eye, Art is as much a necessity as Literature.

On turning now to Architecture, to begin with, we find that man here also appealed to Nature for his first instruction and has doubtless derived his ideas of protection and defence from that afforded by the rock in the desert, or the spreading cedar of Lebanon. We can also trace in the various orders of Architecture their indebtedness to Nature, for as Emerson says: "By surrounding ourselves with the original circumstances, we invent anew the orders and the ornaments of architecture, as we see how each people merely decorated its primitive abodes. The Doric temple preserves the semblance of the wooden cabin in which the Dorian dwelt. The Chinese pagoda is plainly a Tartar tent. The Indian and Egyptian temples still betray the mounds and subterranean houses of their forefathers—the Gothic church plainly originated in a rude adaptation of the forest trees with all their boughs, to a festal or solemn arcade. No one can walk in a road cut through pine woods without being struck with the architectural appearance of the grove. In the woods in a winter afternoon one will see as readily the origin of the stained glass window in the colors of the western sky seen through the bare

and crossing branches of the forest." These remarks will, I think, particularly appeal to any one who has spent any time in the forest, for he cannot but have noticed Nature's aisles and columns with all their ornaments and intertwining arches and tracery. But the point I would like especially to dwell upon, though in a rudimentary way, is, as I have intimated, the parallelism between Literature and Architecture, especially as found in Great Britain and its history. To begin with the early British and Roman periods, of these there are but few traces, but what architectural remains are to be found are characterized by a solidity which the hands of Time and the storms of ages cannot break down. So also we have in our literature, certain marked features which might well be termed immortal, for in every age they have been utilized, even as we find many modern buildings which present the characteristics of several periods of architecture. The literary features which have been so especially well preserved particularly in English literature, but also in Continental, are the various legends associated with the name of King Arthur and the Holy Grail. If now we pass to the Anglo Saxon style which prevailed from the mission of St. Augustine at the close of the sixth ceutury to the Norman conquest, we find the buildings are plain but substantial and serviceable, the arches being either semi-circular or triangular, while there is little or no attempt at ornament or decoration. So also with the literature of the period which is equally plain and unadorned, but very serviceable and practical. Noteworthy amongst the authors of the period I would mention Bede, so generally known as the Venerable, Caedmon the poor herdsman, who, unable to join in the ordinary songs of his companions, found scope in his beautiful account of the Creation, and above all, I would speak of Alfred, the king who wrote and compiled books on so many useful subjects. The Norman period, which came next and prevailed till the close of the twelfth century, was noted for an architecture devoted to much ornamental tracery with also a tendency to imitation of the styles in vogue on the continent even as the customs of the period showed a similar tendency. Towards the end of the period the pointed arch came into favor, and the architecture also became simpler, the columns were lighter and showed the first tendency towards a pure Gothic or better English architecture, hence called Early English. So also at the same time we find the English language

coming more into vogue, and a notable poem appearing in it, the Brut of Layamon. This poem although containing many ideas derived from the French, derives a special British significance from the fact that it reintroduces the Arthurian legends. Following the Early English period, which was particularly characteristic of the thirteenth century, we find the Decorated in the fourteenth century, and it is the most beautiful and ornate as its name denotes. During this period literature is equally ornate and presents the pioneers of our great names in both prose and poetry, for during this age we have the writings of William Langland, who wrote under the name of Piers the Plowman, John Wycliffe, and above all, Geoffrey Chaucer, who, in spite of the colour given to his writings by those of Continental authors, is so thoroughly English and truly the father of English poetry. The Perpendicular period which came next, so called because the tracery of the windows and arches is arranged in perpendicular lines, prevailed till the Reformation. It has also been termed the Florid period from the profusion of ornament made use of, and the literature of the period is also more elaborate.

The chief interest though attaches to the fact that during this age printing first came into use in England, and we also have recorded that Caxton printed the 'Morte d'Arthur eight years before he printed any portion of the English Bible, in response he says to a general "demaund"; for "many noble and dyvers gentylmen of thys royame of England camen and demaunded me many and oftymes wherefore that I have not do make and enprynte the noble hystorye of the saynt greal, and of the moost renomed crysen king, fyrst and chyef of the thre best crysten and worthy, kyng Arthur, whyche ought moost to be remembered emonge us Englysshe men tofore al other crysten kynges."

After the Reformation the tendency of the architecture was more and more towards the Classical orders adopted by the Italians, and literature also became more pedantic, although Spencer, Shakespeare and Milton all made use of the Arthurian legends.

In this century even as we find a revival of the taste for Gothic archecture, so there is a demand for the plain, good old English language, and a very prominent place is occupied by the tales of King Arthur and his Court, in the beautiful idylls of the King of the late Poet Laureate. For in spite of their frequent handling through-

out the preceeding ages, they are, thanks to his beautiful pen, if possible more lovely than of old, even as the old flint of the British and Roman builders takes as fine a polish as ever at the hand of the modern builder.

While there is such a parallelism noticeable in the general characters of Literature, Art and Architecture throughout the ages, we must also bear in mind that while all three were at first a necessity as a matter of protection and defence, soon they assumed a religious character. Mr. Boyle showed us in his paper last winter how Man has ever had a desire of commanding. This is shown not only in his deeds and words, but also in his songs and tastes that at first formed the literature, while his first architectural efforts were also with a view to defence, but he soon showed that he had an idea of an Omnipotence that is to be feared and therefore propitiated. From this arose, as higher ideas were formed of the Almighty, the true sense of worship. A good example of this early prominence of religious thought at the same time as the commanding, or in a sense warlike spirit, was shown us in the history of Caedmon and his religious poetry attracting as much attention as the heroic ballads of the time. Following this religious development shown in the building of churches as well as of castles, we find Alfred providing literature of all sorts. So later on after the Reformation, when, as I intimated, thought become more elaborate, we find that architects were able to devote their attentions to mansions that were not mainly intended for castles or places of worship, while the literature was also devoted to the domestic or social side of life. And in our time we are finding that while there is a revival of the admiration for that which was so characteristic of our English ancestors, we have room for ideas in literature and art, not only classical but also that of foreign schools, and we also find literature realizing the aim of King Alfred and Caxton when they sought to provide books for every man.

As I have said so much about the architecture, which is mainly to be found among the older countries of Europe, you will doubtless remind me that we are living in a new country where such is not to be found, truly so, but even as our ancestral heritage was derived rom these countries we cannot do better than to study their literature, architecture and art as best we may.

Now, having laid down these lines of literary study to be followed,

for at the best they are only hints, let us turn our attention for a few minutes to the study of Nature and Science, which our Association claims as such an especial object. On the value of such a study, I think I dwelt sufficiently in my address of a year ago, but while I have dwelt at such length on the intimate association of our literature and art with our inmost natures, we cannot lose sight of the fact that man, when he made his first hieroglyphics from objects presented to him in Nature, was making his first studies in natural history. So also the fact that man banished from Eden had to live by the sweat of his brow, would soon cause him to study the reason or science of those natural processes of growth peculiar to the animals and plants upon which he was dependent for food. Nor should we lose sight of the fact that, in the progress of Literarure and Art, one of the great features of the thought of this century is the attention paid to Nature and its various phrases. We must also bear in mind, that while there is such a need for Literature and Art, we are to obtain it in all directions and should ever have our ears and eyes ready to receive the best from every source, so that we can say with Milton, "Whichever thing we see or hear sitting, walking, travelling or conversing, may be fitly called our book." We should also remember when considering the Architectural side of our history the very apt lines of Longfellow, which are so particularly encouraging to those who may fancy that their opportunities of achieving great results are so very limited:

"All are architects of Fate,
Working in these walls of Time;
Some with massive deeds and great,
Some with ornaments of rhyme.

Nothing useless is, or low;
Each thing in its place is best;
And what seems but idle show
Strengthens and supports the rest."

As regards the work that we as an Association have done, our various sections have not been idle, and while our Geological and Biological workers have taught us much about the Geology, Fauna and Flora of this neighbourhood, equally good work has been done by the Camera section. The work of this section is particularly deserving of commendation, because, apart from the mere pleasure of

taking pictures, it on the one hand encourages a knowledge of Optical and Chemical science, while on the other it cultivates an artistic taste and leads the earnest worker to see new beauties in nature that will much enhance his enjoyment of life.

Let us then continue in our various sections of this great work that we, as a Scientific and Literary Association have taken up, and though we may not have suffered the peculiar temporal reverses of Shakespeare's exiled duke, still we have had our disappointments as regards the non-fulfilment of our ambitions, and as much perhaps those of an educational character, so should be the more ready with him to say:

> "Sweet are the uses of adversity
> Which, like the toad, ugly and venomous,
> Wears yet a precious jewel in his head;
> And this our life, exempt from public haunt,
> Finds tongues in trees, books in the running brooks,
> Sermons in stones, and good in everything."

THE DARWINIAN THEORY OF THE TIDES.

Read before the Hamilton Scientific Association.

BY JOHN A. PATTERSON, M. A.

We are all in some sense familiar with the phenomena of the tides as commonly understood to be the rising and falling of the waters of the ocean caused by the attractions of the Sun and Moon. There come to us many school-day memories when the diagrams in our geography book or those drawn on the blackboard by some long ago preceptor exhibiting circles with elongated wings illustrated to us those diurnal heavings of the bosom of the sea. We may, too, have stood beside the shore and have seen—

> "The Ocean at the bidding of the Moon
> Forever changing with his restless tide."

And we may have watched the rising of the little waves smoothing down the ruffled sand with their soft white hands, and then the ebbing away following that mysterious pull from Sun and Moon which has been working from remote æons of ages. Twice every day, like every God-fearing man in the morning and evening, the ocean, being God-created, lifts itself to heaven and worships, and twice every day after its orison and matin it sinks back to its level and pursues its round of daily service or nightly rest. Those who see this every day phenomenon never think that wrapt up in this are those eternal principles on which the vast problems involving the origin and history not only of our solar system but of other celestial systems depend.

These attractions of Sun and Moon are most easily exhibited in their effects on the water that wraps the Earth, and though the Earth is comparatively solid, yet it is not perfectly rigid, and therefore it is that its shape is even now thus affected, although from their minuteness they may be incapable of registration. But that was not so before "the beginning," when the earth was in her molten or plastic condition, and then it was that the strong hands of her parent Sun

and even those gentle touches from her child, the Moon, helped to mould and carve our Mother Earth, and prepare her for the habitation of sentient and thinking beings. And thus the word "tide" is not merely a rising and falling of the Earth's waters, but has a wider sweep and has a vaster sky line, it must include alternating deformations of a solid and elastic or of a molten and plastic globe. In fact the theory of tides properly investigated and given its proper place in scientific research is a chapter in the unfolding of the vast problem of Evolution, that multiform and brilliant philosophy of the universe which has taken so deep hold of the science and literature of our time. The tide-problem fully studied is another minaret in that glorious temple, the foundation stone of which was laid by Charles Darwin; it is another chord in that great rhythm that proclaims the universality of intelligent law, dethrones blind chance and exalts the Creator working through eternity not by revolutionary dramatic fiats, but by invincible evolutionary purpose and unceasing Providence. And we shall see, too, how where more fully studied this problem deals not only with the question of our past origin but with our future goal, not only with our "whence?" but with our "whither?" and gives rise to many curious and far reaching astronomical speculations.

From the pen of George Howard Darwin, the Plumian Professor in the University of Cambridge, only last year came a book on "The Tides." It is verily a discussion of that problem down to date—a classic, presenting in a popular form the mathematical argument as organized common sense, and smoothing out the intricacies of this most interesting subject. It is a book of nearly 400 pages, illustrated by 43 diagrams, many of them intricate and demanding close attention. A short account of the principles and theory of the book will, it is trusted, encourage my hearers to read more fully and accurately for themselves. Some account of the knowledge the ancients had as to the theory of tides may be interesting. Aristotle and Pytheas of Marseilles, pointed out the connection between the phases of the Moon and the tides. Julius Cæsar whi'e fighting the yellow-haired Gauls took occasion to notice the connection between the Moon and spring tides. He says:—"*Eadem nocte accidit, ut esset luna plena, qui dies maritimos æstus maximos in Oceano efficere consuevit.*" And he tells us how in consequence his ships broke from their

moorings because "*nostris id erat incogniaum*"—his legionaries being accustomed to the navigation of the Mediterranean where the tides are hardly noticable. While Pliny says, "*verum causa in sole lunaque*"—Seleucus, the Babylonian living near the Red Sea, noticed that when the Moon was in the equinoctial the tides followed each other regularly, but when she is not there, but in the solstices, thr height and succession of the tides were irregular, and that this irregularity depended upon her distance from the equator. Modern astronomers would express that by stating that the diurnal inequality vanishes when the Moon is on the equator, and is at its maximum when the declination is greatest. Seleucus must have watched the Atlantic tides where this diurnal inequality is almost evanescent, and he must have observed the tides of the Indian Ocean, especially about Aden, where the diurnal inequality is very great. Kepler indicated that the Sun and Moon moved the water, but his suggestion of gravitation was the merest surmise, and Galileo criticised Kepler in not exhibiting his usual acuteness while he referred the phenomena to the rotation of the Earth.

The true theory of tide generating force was not expounded until Newton, in his Principia in 1687, by his genius established the foundation on which the whole philosophy of tides rests. If I may be permitted to rest and turn aside from the path of serious and honest inquiry, and to drift into Mohammedan romance, I may quote from the prophet "on whom be the blessings of God and His peace," when he says, "Verily the angel who is set over the seas places his foot in the sea and thence comes the flow, then he raises it and thence comes the ebb."

We are all more or less familiar with the ordinary theory of the tides.

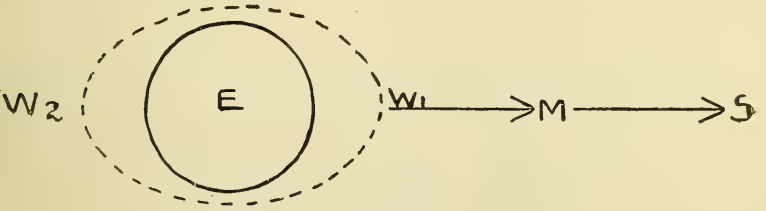


Fig. 1.

When the Moon (M.) and the Sun (S.) are in conjunction as in Fig. 1, their combined attractions lift the volume of water W_1 from the solid earth E and thus a high or spring tide is generated. Furthermore, the same effect is produced at the other side of the Earth inasmuch as the combined attraction of M. and S. pulls the Earth away from the water $W2$ and so leaves the water heaped up there, and thus here also a spring tide is generated. This is the position at new Moon on both sides of the Earth.

Fig. 2.

When the Moon (M.) and the Sun (S.) are in opposition as in Fig. 2, their attractions are opposed but still spring tides are produced as before. This is so because the sun pulls the water W^1 from the solid mass of the Earth and also the Earth away from the water $W2$, and so leaving $W2$ heaped up. The Moon has similar effects on $W2$ and $W1$. This is the position at full Moon on both sides of the Earth—the solar and lunar tides combine just as in Fig. 1.

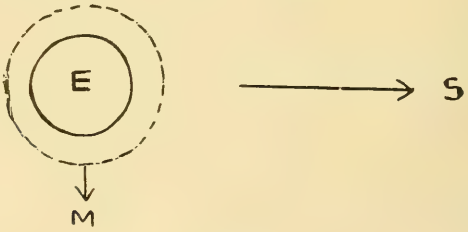


Fig. 3

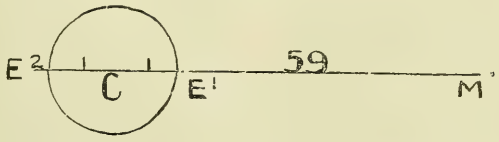
When the Moon and Sun are in quadrature or 90° apart as in Fig. 3, then the water is more or less equally distributed over the Earth for reasons evident upon an examination of the different attractions of M. and S. as explained with respect to Figs. 1 and 2. In this position the Sun and Moon attract separately and not in conjunction, and it is the same whether the Moon is 90° east or 90°

west of the Sun, and so at each of the two half-moons in the month, that is, at the first and third quarters, the neap-tides, which are the lowest, occur.

Furthermore, the lunar tide is the highest, for although the mass of the Sun transcends that of the Moon, yet the Moon is so much nearer that its effect is greater. It must also be remembered that the tidal effect is produced not by the attraction of the Sun or Moon only but by the difference of the attractions exercised by each of these bodies upon the nearer and further sides of the Earth and the water envelope. And as the proportion of the Earth's diameter to the lunar distance is much greater than the proportion of the Earth's diameter to the solar distance the lunar tide is the stronger. These fractions roughly are :—

$$\frac{8000}{240{,}000} \text{ and } \frac{8000}{92{,}000{,}000}$$

As this is an important matter let us get at this proportion more closely. As the tides are occasioned by the attraction of gravitation it is easy to premise that for equal distances the tidal effect must vary as the mass of the attracting body. And if the problem of the tides was simply a question, what is the attractive force exerted by a heavenly body upon another heavenly body as the Earth? The question would be answered by the statement that the effect on the ocean would vary directly as the mass of the attracting body and inversely as the square of the distance of the attracting body. But as has been already said the tide depends not on this but on the differentiation between the attraction on one side of the Earth and the attraction on the other side of the Earth. This is more complicated. Let me proceed to demonstrate the true law without having recourse to anything but ordinary school arithmetic.



Let $C\,M$ represent the distance from the centre of the Earth to the Moon, which is 60 times the semi-diameter of the Earth which we will take as a unit of measurement.

$$E_2C = CE_1 = 1 \text{ and } E_1M = 59.$$

Now the attraction at E_1 exceeds the average

by $\frac{1}{59^2} - \frac{1}{60^2}$ which $= .000,009,49$;

but $\frac{2}{60^3} = .000,009,26$;

$\therefore$ the difference nearly $= \frac{2}{60^3}$.

Again, the attraction at $E2$ exceeds the average

by $\frac{1}{60^2} - \frac{1}{61^2} = 000,009,03$;

which nearly $= \frac{2}{60^3}$.

These two over balances are therefore nearly equal and vary inversely as the cube of the distance of the Moon from the Earth. The law therefore is that the tide generating force varies directly as the mass and inversely as the cube of the distance of the mass

or $$F \propto \frac{M}{D^3}$$

To compare the tide-generating forces due to Sun and Moon

Mass of the Sun = 331,000 Earth mass
Mass of the Moon = $\frac{1}{81}$ Earth mass
Sun's distance = 390 Moon's distance

$$\frac{\text{Solar tide-force}}{\text{Lunar tide-force}} = \frac{\frac{331,000}{390^3}}{\frac{1}{81}}$$

$$= \frac{331,000}{39^3 \times 1000} \times \frac{81}{1} = \frac{331}{3^3 \times 13^3} \times \frac{3^4}{1}$$

$$= \frac{3 \times 331}{13^3} = \frac{993}{2197} \text{ nearly} = \frac{999}{2190}$$

$$= \frac{33}{73} \text{ nearly} = \frac{30}{70} = \frac{3}{7}$$

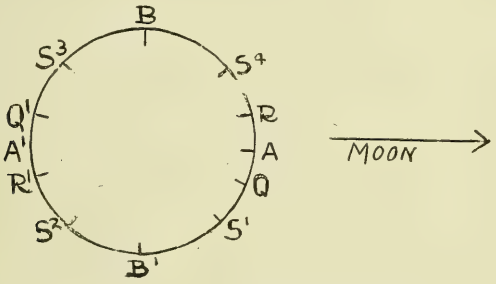
If lunar tide be 1.

Then lunar tide + solar tide = spring tide

$$= 1 + \frac{3}{7} = \frac{10}{7},$$

∴ Proportion of spring tide to neap tide is as 10 to 4.

A short explanation of what is meant by the priming and lagging of the tides should now be made :



Between new Moon and first quarter, the Sun is over a point S_1 behind A. Here the Moon tends to draw the water towards A, A', and the Sun tends to draw the water towards S_1 and the antipodal point S_3. Therefore the combined action tends to draw the water towards two points Q, Q' between A and S_1 and between A and S_3 respectively, whose longitudes are rather less than those of A and A' respectively. The resulting position of high water is therefore displaced to the west, and the high water occurs *earlier* than it would if due to the Moon's influence alone. The tides are then said to *prime*.

Between first quarter and full Moon the Sun is over a point S_2 between B' and A', and the combined action of the Sun and Moon tends to draw the water towards two points, R, R^1, whose longitudes are slightly greater than those of A, A'. The resulting high tides

are therefore displaced eastwards, and occur *later* than they would if the sun were absent. The tides are then said to *lag*.

Between full Moon and last quarter the Sun is over some point S_3 between B *and* A', but the antipodal point S_1 is between A and B'; hence the *primes*.

Between last quarter and new Moon, when the Sun is at a point S_4 between B *and* A, it is evident in like manner that the tide *lags*.

Hence spring tides *occur at the* Syzygies (conjunction and opposition). Neap tides occur at the quadratures.

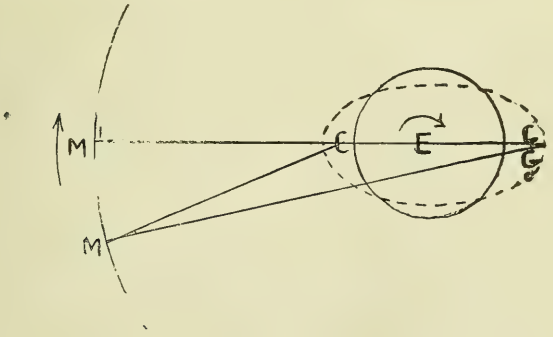
From Syzygy to Quadrature the tide primes.

From Quadrature to Syzygy the tide lags.

All mathematicians know the difficulty of working out the problem of the three bodies. So complicated is it that it defies the instruments of analysis. The problem of two bodies is capable of exact demonstration. This is somewhat analogous to the difficulty of predicting tides by calculation. If the globe were covered with water to a uniform depth and the friction of continents and configuration of land and the complications occasioned by estuaries and bays and inlets and varying depth of ocean were eliminated, then the tidal problem would be an exact one, but that would be a condition of matters where the solution of this problem would be useless as the Earth's inhabitants would be aquatic creatures whose calm content would not be disturbed by any perplexing inquiries from the "crossgrained muses of the cube and square." Or if the ocean ran in parallel canals belting the Earth and were of uniform depth then the theory of tides and calculations as to tides would be of the most charming simplicity and the happy peoples who would then inhabit the dividing banks could delight themselves with the most gentle exercise. But we must take things as they are and we find most irregular distributions of land and water and varying depths of ocean, and hence the prediction of tides by calculation is one of the most complicated problems of practical astronomy. Theoretically at new and full Moon high water would be exactly at noon and at midnight, but roughly speaking the tides follow the Moon's course so that high water always occurs about the same time after the Moon is on the meridian And as the Sun crosses the meridian with the Moon at new or full Moon the hour of the clock at which high water occurs at such periods is in effect a statement of the num-

ber of hours which elapse between the Moon's meridional passage and high water. This is called the "establishment of the port" and is constant for any particular place. Thus the establishment of the port at London Bridge is 1 h. 58′, so that lunar high water occurs 1 h. 58′ after the Moon's transit—and the same with the solar high tide. The actual high tide being due to Earth and Moon conjointly is earlier or later than the lunar tide by the priming or lagging. By adding a correction for this to the "establishment of the port" the time of high water may be found for any phase of the moon.

Knowing, as we do, the effect of gravitation, and knowing, too, that the Earth and Moon and planets are nearly spherical in shape, we conclude that these bodies were once molten and plastic. A swiftly moving fly wheel will continue to revolve for a long time after the moving force has ceased to operate. Its inertia will carry it on, but the friction upon its bearings, the Earth's attraction and the resistance of the air will at length reduce it to rest. The Earth has no bearings, but yet the tidal friction applied as it is to its surface acts as a brake, and must thus retard the Earth's rotation, and as by Newton's Third Law of Motion, action and reaction are equal and in opposite directions it must follow that as the Earth is retarded the moon is accelerated. This proposition, however, demands a more careful investigation.



Let the circle represent the normal shape of the Earth rotating in the direction of the curved arrow. Suppose the water envelope or the plastic mass of the Earth to be devoid of friction and to take

the shape represented by the ellipse, and at this moment let the Moon be at M_1. But in fact there is friction and the crest of the wave or the protuberances of the ellipse is belated and, therefore, carried onward by the Earth in her rotation beyond the proper position. To put the figure right and avoid confusion, let the Moon be set back to M which is the proper relative position when the effect of friction and rotation are taken into account. What now is the effect of the Moon upon the egg-shaped Earth? Suppose the tidal protuberances to be centralized in and represented by two masses at C and C_1, respectively. Now it is evident that the attraction of M on C tends to retard the Earth and the attraction of M on C_1, tends to accelerate it. And as C is nearer to M than C_1, it must follow that the retarding pull is stronger than the accelerating pull. Therefore, it is clear that the first effect of fluid friction is to throw the tidal protuberances forward, and the second effect is to retard the Earth's rotation. Action and reaction are equal and in opposite directions, and as the Moon pulls the tidal protuberances they in turn pull on the Moon and therefore the Moon is carried forward in the direction of the arrow. This increasing force will force the Moon out to move in a spiral curve at ever increasing distances and thus the time of the Moon's revolution is increased. And not only so but the effect of this accelerating force is actually to retard the velocity. Thus for both reasons the length of the month (the time of the Moon's revolution round the Earth) is increased. The same result has been shown as to the length of the day (time of Earth's revolution round her axis). The result may be presented in another form. The attraction of the tidal protuberance increases the Moon's aerial velocity. Now in a circle the aerial velocity $V \propto \sqrt{R}$. Therefore as V is increased the Moon's distance R is gradually increased, and hence also her periodic time or month is increased. This is true theoretically, but the investigation of astronomical records since observations have been made does not offer much or any corroboration to the rigid mathematical proof—the changes for centuries past have been so slow. But it does not follow that this has always been so. When the Moon and Earth were gifted with more juvenility in the remote ages relative changes were far more rapid. Let us remember that the tide-generating force

varies as the inverse cube of the distance between the Moon and the Earth, so that if the Moon's distances is reduced $\frac{1}{3}$, $\frac{1}{4}$ or $\frac{1}{5}$ of its present distance then the force and the tide generated would be 27, 64, 125 times as great. This is, however, only half the truth. We must not forget that while tide is being augmented the Moon's attraction is also increasing. These two coalesce and each is increased as the cube of the distance decreases, so that the cube power must be squared or made the sixth power. The tidal retardation of the Earth's rotation therefore varies inversely as the sixth power of the Moon's distance. For example, when the Moon's distance was reduced to $\frac{1}{10}$ of the present distance then the tidal action was 10^6 or 1,000,000 times as great as at present. The action at present may be slow enough but when the Moon was nearer us it went on with immense rapidity. Looking forward in point of time we will reach an era when the earth will take about 1,400 hours to turn on her axis, and the Moon will take the same time to make a revolution round the Earth. The result will be that the Earth and the Moon will go round their common centre of gravity as if united by a solid bar and locked together in about 55 of our present days with the day and the month identical in length. The lunar tides will then cease, and any retardation of the Earth due to the Moon can then no longer exist. Solar tides will, however, continue to exist so long as water is left on the Earth. The solar tide will thus retard the Earth's rotation and so further lengthen the day ; this will retard the Moon's motion and diminish her aerial velocity. The Moon will therefore approach the Earth and will ultimately fall into the Earth in a long, ever-contracting sweep. The Earth will thus finally turn the same face to the Sun, and so remain locked with perpetual day over one hemisphere, and perpetual night over the other. As the system can be traced forward to the 55 day period, so it can be traced back until we find the Moon revolving round the Earth and almost touching the Earth in a period of between three and five of our present hours. And thus beauteous Luna had her birth from the fiery Earth æons ago, when in the throes of a world's parturition she was thrown off to seek her fortunes in the universe and work out her destiny as our satellite, once doubtless a flower-spangled world, with refreshing streams and heaving oceans and gentle breezes, now a derelict, a ruined world. In the ages yet to come whose

number can alone be reckoned in the arithmetic of heaven, this fair daughter born of her Earth-mother will in a long, circling spiral come back again and gently, like a fallen blossom from one of Earth's flowers, fall back on the bosom of her parent not with a crash of colliding spheres and the heat of riven globes, but softly make her grave where her cradle was in the long ago past.

The effect, therefore, of solar tidal friction is to retard the revolution of the Earth while the revolution of the Moon in her orbit will increase. Until recently no case of a satellite having a less period than its planet's rotation appeared to exist, and it was therefore argued that the theory was unsound, as not being borne out anywhere in visible nature. But in 1877, Professor Asaph Hall discovered two satellites of our neighbor Mars, which he named Phobos and Deimos—Fear and Panic, the dogs of war. The period of Deimos is about thirty hours, and that of Phobos something less than eight hours, while the Martian day is something like twenty-four hours Here then is an illustration of the future condition of our Earth-Moon system for the solar tidal friction having such an effect upon Mars which is so much nearer the Sun than our Earth has slowed him down so that Fear circles him round nearly three times every day, which would surely be enough to drive all the warlike spirit out of him. The ultimate fate of this satellite will therefore be absorption into his planet. The Mars-Phobos system is therefore further advanced and it will remain for astronomers in coming centuries to discern any approach of Phobos to his parent Mars.

If Darwin's theory be true we would naturally turn to Mercury and Venus and see what effect solar tidal friction has had on their rotation periods. As the solar-tide raising force varies inversely as the cube of the distance of the planets, these solar tides are far greater on Mercury and Venus than on our Mother Earth. Although younger in point of years than Terra, as indeed would become the Queen of Beauty and the swift-footed messenger of the gods, yet as Sun-plant systems they are older because their gradations are farther advanced. It would therefore be reasonable according to the theory that we are investigating that the immense solar tides must have diminished their periods of rotation that they are united as at the end of a bar with the Sun as obtains in our Earth-Moon system and so like loyal courtiers they keep their faces always turned to the

Sovereign Sun. The keen-eyed Schiaparelli of Milan has announced such to be their relative condition as the result of his observations, and these have been corroborated by Percival Lowell and T. J. See, working at Lowell Observatory at Arizona, under the very best atmospheric conditions.

The theory of tidal action has an important place in the evolution of celestial systems. The nebular hypothesis as suggested by Kant and developed by Laplace and modified by G. H. Darwin and Poincaré is the most reasonable theory of evolution yet presented. Time forbids more than a passing reference to it. Apart from any hypothesis based on the dynamics of a rotating nebula, and the evolution thereirom accompanied with the attendant phenomenon of tidal friction it is interesting to note that very recent investigation of the great nebula in Andromeda seem to indicate the lenticular shape with its central condensation, the annulation of the outer portions and even the condensation in the rings which are destined to form planets. The Scriptures of the sky, therefore, appear to reveal to us Nature in parturition, and a celestial system being evolved before our very eyes in the great nebula of Andromeda. By the theory of tidal friction our Moon took her origin very near to the present surface of the Earth. To account for the orbits of the satellites of Mars, Jupiter, Saturn and Neptune, we must have recourse to the nebular hypothesis. The Earth-Moon system is unique. The Earth is only 80 times the weight of the Moon, while Saturn weighs about 4,600 times as much as its satellite Titan, which is the giant satellite of the solar system. All other satellites in other systems but ours are infinitesimally small in comparison with their primaries. As a reason explanatory of this peculiarity of the Earth-Moon system it should be remembered that the Earth is nearer to the Sun than any other planet attended by a satellite. By the nebular hypothesis rings are, so to speak, shed from the central nucleus when the nebula has contracted sufficiently to create a proper degree of increase of rotation. If from any external cause this rotation is retarded then the genesis of the ring is retarded or indeed may be entirely prevented. The friction of the solar tides furnishes this external cause. We therefore find that Mercury and Venus have no satellites, the Earth has one, Mars two, Jupiter five, and all the exterior planets

have each a retinue of satellites. In the Earth system the genesis of the moon was retarded by the solar tidal friction but not actually prevented.

The phenomenon of double stars presents a special study in the investigation of tidal phenomena. It is impossible that so many systems of double stars should have attained their relative positions by an accidental approach from the infinite depths of space. Tidal action tends to increase the eccentricity of the orbit in which the bodies revolve about one another and the results are much increased when the two bodies are not very unequal in mass. It is remarkable that spectroscopic observations show that the orbits of the majority of the known "doubles" are very eccentric. Tidal friction causes, too, a repulsion between the bodies and so as in the Earth-Moon system, the two members of a binary system must once have been close to each other. The next step is the rupture of the parent nebula in the form of an hour-glass into two detached masses, as witness the great dumbell nebula (27 Messier Vulpeculæ). Dr. T. J. See's observations and ingenious theories have done much to develop this philosophy of Dr. Darwin's ; let us remember that conjecture is the parent of discovery and often the grandparent of truth. Future researches with the photographic plate, the spectroscope, and the telescope, and their results interpreted by skilful astronomers, will open to us yet marvellous vistas of observation ; like the Queen of Sheba we may yet have occasion to be startled with many sparkling gems of discovery and exclaim that the half was not even dreamed of.

Tidal action has been in the mighty hands of the great Sculptor the instrument by which he has hewed out the outlines of our globe, working out new beauties, softening down harsh lines, and reducing her more and more fit for the habitation of man. Mother Earth sent forth her daughter Moon ages ago, and since then, obedient to Earth's impulses, and never leaving her, she has with strong but gentle hands, moulded Earth's plastic form into shapes and curves, and worked out with its wondrous friction coupled with Earth's internal forces these configurations of ocean and continent that are now with us. And since Earth became in a sense solidified, the Moon has kept the oceans moving and heaving and health-giving, deftly shaping and rounding the fulness of her beauty. Many times

Earth's face has changed and it is changing yet; lands have been swept away and seas wash in the palaces of former kings.

> There rolls the deep where grew the tree,
> O Earth what changes hast thou seen!
> There where the loud street roars hath been
> The stillness of the central sea;
> The hills are shadows, and they flow
> From form to form, and nothing stands,
> Like mists they melt, the solid lands,
> Like clouds they shape themselves and go.

THE NEUTRAL NATIONS.

THE ERIES.

Read before the Hamilton Scientific Association

BY MARY E. ROSE HOLDEN.

"Who then lives to mourn us? None.
What marks our extermination? Nothing."—SENECA.

"Not Hindoo, Afgan, Cushite or Parsee,
The Indian his own prototype must be."

The occupants of the shores of this lake by the ancient and extinct tribe of the Eries, who were once the acknowledged pacificators of the neighboring Indians, and who preceded the Iroquois in warlike and civic power within that basin, gives a melancholy interest to whatever in the existing archaeological remains of the country, serves to restore the memory of their power.

They appear to have been in the plentitude of pre-eminence and of a civilized strength and influence at the period of the first discoveries of the French in the beginning of the seventeenth century. The Wyandot-Hurons at that time had not been disturbed from the possession of their ancient territories on the shores and valley of the St. Lawrence. The Eries seem to possess unique claim to remembrance, which cannot be urged by any other American tribe—a claim still older than the days of Hiawatha, viz.: that of kindling the Council Fires of Peace for all the tribes of the continent.

According to the French Missionaries, the Eries were at the head of the *singular league known as the Neutral Nations.* Their territory extended from the extreme west to the eastern shores of Lake Erie, including the Niagara valley, and of whom the Kau-Kuas, of Seneca fame and tradition, were manifestly only one of the powers. The dispersion of the Eries, according to European writers, took place in 1656 ; according to Cusick that event occurred at the time of Cabot.

The following facts are well authenticated: The Neutres kept their neutrality until 1634 ; they had 36 villages in 1641 and a gar-

rison of 4,000 warriors, with a total population of 12,000. The first breach of the Covenant was followed by a truce for nine years.

Their history, rise, spread and power and final fall is involved in a degree of obscurity which is all the more stimulating from the few gleams of tradition given. There is no doubt that the Institution of the Pipe of Peace Council must have been subject to a very delicate exercise of authority, and which was also often fluctuating in its power, it was finally overthrown by some indiscreet act. The power to light this pacific fire is represented as having been held by a woman, and after its final extinction in the area of western New York, it was equally clear that hereafter it began to flicker. It was finally put out in terrible bloodshed by the increasing and conquering Five Nations. The fate of the Eries has excited deep interest, and they are still brought to mind by the noble lake and its noted outlet the Falls of Niagara, the lake which still bears their once distinguished name.

They possessed twelve large forts, which were similar to the cities of refuge of the children of Israel. The country was noted for its fertility, game of every kind abounded, and fruits of sunny France flourished in the open air. The Eries were regarded as the Pacificators or Peace Councillors of the many tribes and confederacies which waged war so furiously one with another north, south, east and west of them. In the year 1626 they were ruled by Queen Yag-owanea, "Mother of Nations."

She was called "Gegosasa" by the French and Senecas. They spoke a dialect of the old Huron-Iroquois race, in morale and religious belief, that of living under a Theocracy, they also agreed with these Romans of the New world. The Eries occupied geographically a significant position, their territory lay intermediate between all contending parties—red and white—the various Indian confederacies, as well as the rival European powers in the race for supremacy on the continent. They had already from propinquity and from a certain community of habit, and in spite of their supposed perfectly established neutrality between the powers, been drawn into a secret friendship with the Mississagies who dwelt on the west and north of Lake Ontario. Totemic ties of consanguinity, as well as the sacred trust of Kindler of the Peace Fires of the continent, should have kept Gegosasa true to her guardianship and faithful to her vows of vir-

ginity, trust and vows which required greater wisdom than this last Queen of her dynasty possessed.

The first war was caused by an act of perfidy, and from the account given by David Cusick, Yagowanea, was in some respects another Zenobia. But Yagowanea sacrificed an empire of neutrality to the passion of love she entertained towards a Mississaga Chief.

There is a good deal of evidence given among many nations of this continent that the order of Vestal Virgins was a recognized one among the N. A. Indians. This summer, 1899, while visiting Medad, I heard the following tale, scarcely yet has time elapsed to dignify it into tradition :

When the vicinity of Medad was first being searched for relics, some delvers in their diggings on a knoll overlooking the weird waters and their surroundings, came across a solitary grave which held the skeleton of a woman—what was left of her mouldering cerements and the crumbling bones exposed to the open air were all that remained of a woman of rank. By what token, or by whom first whispered, it is not known, but 'tis said, " through loss of her " virtue, this woman was buried in a lonely grave, her remains not " being thought worthy of burial in the communion ' pit,' of family. " tribe or race."

According to Horatio Hale, " It is likely that the Eries separ- " ated from the parent stock earlier than the Iroquois, and that " they were thus enabled for a time to avoid becoming embroiled in " the quarrel between the two great divisions of the race." Of this we are certain, that they were the first to turn their steps southward, cross the Canawaga (St. Lawrence), then turn their faces westward, and follow the setting sun, finally settling down in the rich fields and fruit lands of the central peninsula of Canaiderada, the country of " big lakes and rivers." Father de La Roche, a Recollect, passed the winter of 1626 with the Neutre, Erigh or Cat nations—the first Frenchman who came in contact with the important neutral confederacy occupying the present Niagara escarpment. Most of the villages were on the west side of the Niagara river, their country being the ordinary, neutral passage way between the Iroquois and the Hurons—sworn enemies. On all early maps the Erie cities of refuge, situated on Lakes Erie or Ontario, were at some distance from both lake and river, they were found some miles away from the

water in order that they might not be surprised from sudden attack.

Father de La Roche, in his first attempt to Christianize the Indians, notes the peculiarity which distinguished the Eries from all the other nations of America—the astounding peculiarity of neutrality between fierce and ever contending nations. They spoke a dialect of Iroquois in the western, and in the northern cantons the dialect was of the Huron type, while on the banks of the Niagara a very close relationship existed with the Seneca speech.

This is the only confederacy which we read of in America, which was governed by a woman. According to David Cusick in his history of the Five Nations, first published in 1825, the final destruction of the Eries was caused by an act of perfidy. The wampum and peace pipe of the Mother of Nations was held sacred; all who sought the shelter of her lodge were considered safe from their pursuers until such time as the question in dispute should be discussed by representative chiefs from the nations representing the litigants, the Queen, through virtue of her office, rendering judgment on the case, a verdict from which there was no appeal.

The central point of her authority was a place called Kieuka, on the Niagara ridge and not very far from the present village of Tuscarora. Protected by the sanctity of her office, a reputation which seems to give evidence of the truth of the assertion which has been made that the order of *Vestal Virgins was a recognized one among the N. A. Indians, she had a council house and a contiguous building, where she received messengers and ambassadors from the Five Nations, the Wyandot (Huron), Mississagies and others. Her lands extended to the foot of Lake Erie and along the head of Lake Ontario. Near the "head of the lake" (Ontario), an outrage occurred, which she caused summarily to be punished, and which led to the fatal breach of neutrality. The Seneca warriors had been received and had begun to smoke the pipe of peace when a deputation of Mississagies were announced. These latter informed the queen that the two men before her had just returned from assassinat-

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*NOTE.—This is a tradition corroborated by the fact that the Indians still shows some medicinal plants which they say are very salutary, but which have no virtue unless administered by Virgin hands.

ing their noted chief, the queen's lover. They demanded the right of blood, and this demand was instantly granted, though in violation of the sanctity of her lodge as a place of refuge. The Senecas were put to horrible death by the Mississagies. Intelligence of this breach of procedure in the queen's office spread in every direction. The Iroquois, the aggrieved party, flew to arms. The Queen, when her frenzy of grief had time to calm, realized what in her temporary oblivion of all around her she had jeopardised for herself and people—she knew what awaited her at the hands of the Iroquois—but the warlike instincts of her forefathers rose to the occasion. She at once dispatched messengers to Onondaga to explain her position and to modern Buffalo, her chief garrisoned city. She also appealed to the War-an-ak-arana (Andastes), who were encamped then on the banks of Lake Erie to come to her assistance. She went herself to Buffalo and at the head of a very large force of warriors proceeded rapidly towards the Genesee river where the first engagement took place. She was met by fifteen hundred Senecas under Shorikowana, a most noted Seneca warrior. The two parties met about midway between Canandaigua lake and the Genesee river, and near the outlet of two small lakes, near the foot of one called Hon-ey-oye, the battle was fought.

When the two parties came in sight of each other, the outlet of the lake only intervened between them. The entire force of the Iroquois was not in view of the Eries. The reserve corps of one thousand young men had not been allowed to advance in view of the foe. At sight of their opposing force on the opposite side of the stream, the Eries impetuously rushed through the water and fell on the enemy with tremendous fury.

Notwithstanding the undaunted courage and bravery of the Iroquois they could not withstand such a terrible onslaught, they were compelled to yield the ground on the bank of the stream. The whole force of the Iroquois, except the corps of reserve, now became engaged; they fought hand to hand and foot to foot; the battle raged horribly, no quarter was asked or given on either side. As the fight thickened and became more and more desperate, the Eries for the first time became sensible of their true position. What they had long feared had become a fearful reality. *Their enemies had combined together for their destruction*, and they now found themselves

engaged suddenly and unexpectedly in a fearful struggle, which involved not only their high prestige as arbitrators of America, and also as the glorious custodians of the National Pipe of Peace, but the fate of their national existeuce now hung on the issues of the day. They were intensely proud, the word of their Queen, "Mother of Nations," had from immemorial time been unquestioned law—a power felt and a superiority acknowledged by all the surrounding tribes. All these considerations flashed upon the minds of the bold Eries, and nerved every arm with almost supernatural strength and power.

On the other hand, the united forces of the once weaker tribes, but seventy years joined together as a league and confederacy by Hiawatha, and made strong in their union, fired by a spirit of emulation and excited to the highest pitch among the warriors of the different tribes brought for the first time to act in concert; inspired with zeal and confidence by the counsels of the wisest chiefs, and led on by the most experienced warriors of all the united tribes, the five nations were invincible. Though staggered at the first desperate onslaught of the Eries, the Iroquois soon rallied and made a stand, and now the din of battle rises higher and higher, the war club, the tomahawk and the scalping knife, wielded by herculean arms, do terrible deeds of battle and death. During the hottest of the conflict, which was fierce and long, the corps of reserve, amounting to one thousand young men, were, by a skilful movement under their experienced chief and leader, placed in rear of the Eries on the opposite side of the stream in ambush. The Eries had been driven seven times across the stream and as often regained their ground, but the eighth time at a given signal from their leader, the corps of reserve in ambush rushed upon the almost exhausted Eries with a tremendous yell.

Shorikowana, the Seneca war chief, was, fortunately for the Eries, killed by an arrow, when Gegosasa proposed terms of peace, which were accepted, and the remnant of her warriors, bearing with them their wounded and as many of the dead bodies of their leaders as they could find, returned to Buffalo. This first war ended in 1634. Upon her return home Gegosasa found internal affairs in a terrible condition. The campaign from which she had just returned proved n the long run the destruction of the neutral Confederacy. Prophets

and Seers in this crucial hour foretold the downfall of Indian supremacy on the continent, dreams were dreamt, visions were seen, woe and the crying of women filled the land, for now the glory and prominence given to the women of old Canada was lost forever, henceforth woman would be degraded, and in her humiliation walk with downcast eyes and in humbleness of spirit until the hour of her redemption sounded.

Distracted by these prophecies and their implied reproaches on her conduct, self-accusations swiftly followed in their train. The stings of an aroused conscience now rent her soul. Where once quarrels and disputes had been settled by peaceful council and arbitration, feuds and seditions ruled, her reign as arbitrator was ended, her influence and claims to be regarded as the judge of her people's rights and wrongs were openly jeered at and derided, her wishes once law were set at naught and disregarded.

"Were these really truths which were daily being hurled at her "as she endeavored to resume her old home life?"

"Had she indeed been the first to set the law of antiquity at "defiance? Was it not owing to her failure in preserving the laws "governing totemic, joined to the violation of her vows of virginity, "that had brought on such disastrous results?"

These and similar questions tortured her soul with the spirit of despair, but at last her courageous spirit whispered hope, "All is not lost," and she vowed yet again that if repentance and atonement could wipe out her bitter shame, that on her part should be done. She determined to make a last appeal to the neutre nations to rally to her standard, beacon fires were lit, and her runners sent forth to summon a grand council. She there confessed her sorrow and bitter repentance, and appealed to the noted chivalrous spirit of her audience for volunteers to aid her in recuperating their losses. Accompanied by her vestals, noted women, counsellors and the chief warriors who still remained loyal to her, she retired to Buffalo. The flower of the nation left her after the first war, those still faithful and believing with their dethroned Queen that "all was not lost" for them, numbered fifteen hundred warriors; these left the disaffected in possession of the central and western towns of the peninsula and gathered themselves around their Queen at Teosah-wa (Buffalo).

The Secessionists were composed of bands of young warriors

under no united leadership ; each clan, under its own elected chief, strove for the mastery over the others in hopes of winning ultimate supremacy.

Adventurous hunters and builders of canoes joined their ranks. The flint arrow makers had followed the queen. Physically both parties of the divided Neutre Nations were the finest body of men on the continent.

This faction having thrown to the winds the most sacred traditions of their forefathers now gave free indulgence to their worst passions. As through the act of their queen failure and loss of prestige had fallen upon them, the sex which had hitherto been so venerated and chivalrously held in their estimation and conduct, should thereafter be degraded and made to suffer. As a nation they had lost standing and rule among nations through the weakness of a woman ; the law regarding restitution governing their national procedure should now, proportionately, be put into effect regarding women. In the tribal communal respect and veneration was paid to women among all North American Indians, in respect to prisoners who were tortured to death women were not to be subjected to the agonies of fire. This law was now broken. The revolted Neutrals not only caused female captives taken in their raids but also of their own women whom they knew or suspected still sympathized with Gegosasa to undergo the atrocious torture of fire, but delighted with fiendish revelry in their suffering death cries.

The richness and fertility of their soil—the abundance of vegetables, fruit and game to be found without almost any exertion—left the duty of providing entirely to the women. Now that the men felt free from any tribal or national obligations to lead respectable lives, they gave themselves up to the enjoyment of every animal instinct. Luxury and self-indulgence has ruined more than one nation which, unchecked by moral law, rendered no homage to, or destroyed the spiritual nature of woman.

Decadence rapidly followed this new mode of life.

A generation of sloth, gluttony and licentiousness of the most depraved character, with now and again as a bloody pastime, rousing themselves to perpetrate cowardly and ferocious raids against weaker tribes of the Algonkin race living to the west of them, brought on swift retribution.

The Mascoutins or "Fire Nations," the people who worked the ancient copper mines of Lake Superior, dwelt on the west side of the river Detroit. It was on these people that the Neutral Secessionists, aided by the Ottawas, now warred. (June, 1642). At the head of the largest combined force of warriors they could muster, they marched against the Fire or little prairie people. They attacked a fortified fort, garrisoned by nine hundred warriors, who bravely sustained the attack, but after a siege of nine days the Mascoutins were forced to surrender. A large number were killed during the siege, four hundred were taken prisoners, four hundred women and children shared the same fate and after having tortured the prisoners, burned the women, gouged the eyes and girdled the lips of the old men of the country, they abandoned their unfortunate victims in their helpless misery to a tragic existence and death.

When the Iroquois heard of these atrocities they met to the number of 1500 men, crossed Gegosasa's diminished territory and in rapid succession, entered village after village of the Secessionists. The greatest consternation ensued, villages were abandoned and the inmates pursued by the conquering Romans of the new world. After being hotly pressed and pursued by the Iroquois, over 2000 warriors, besides women and children were destroyed. Famine and plague destroyed this remnant of the Neutral Nation. The central and western country was devastated.

The Iroquois returned home, taking with them prisoners reserved for adoption or fire.

Meanwhile at Buffalo, Gegosasa still held sway as Queen of the Eries. The Kaw-Kaws, the largest tribe of her old Confederation, remained loyal to her. Their lands stretched from eighteen mile creek (Jordan), along the north shore of Lake Ontario. Near the "head of the lake" on the north-west of Burlington Bay, was stationed their village of Medad, built on the hill overlooking the small lake of the same name.

The ruins of this village visited by the early explorers and Jesuit Fathers, are still to be seen surrounded by much of their primitive beauty and natural loveliness. The spell of nature overshadowing the weird surroundings is cast in a minor key ; the basin or crater of some long extinct volcano whose formation justifies the belief, forms the small, but ancient lake. The basin is placed away up on the

hills, behind the valley of the bay, and by hard measurement, bottom is not struck until a depth of nearly eighty feet. All around the lake basin is a marsh or bog land, so soft in places that in spring time a pole may be thrust down into it to almost any depth. Lake Medad and its immediate vicinity was in a past age of the world's history one of the great gathering places for Indian peoples of Ontario, they loved the spot, and not only loved and lived, but buried their dead there.

At the first council which the queen held after the Genese engagement, the Eries decided to employ their time of truce in training their youth in every possible warlike exercise, in order to make themselves ready when the opportunity offered to retrieve their lost position with the Iroquois. Still confident in their superiority over any one of the tribes inhabiting countries within the bounds of their knowledge, they trusted in what they believed to be their own inherent greatness, to re-assert themselves eventually with the Five Nations. No protest was therefore made when deputies sent from Onondaga requested "right of way" over her possessions when the Iroquois set out to revenge the Mascoutin butcheries. Gegosasa still nursed her projects for the future, and present peace must be had at all hazards. There also remained little doubt in her mind of the results of an encounter between the warriors of the Great League of the United Households, and her own undisciplined, debased old Covenanters. Better far that those who had once called her "mother," should meet their deserved punishment from the flail of the Iroquois, than that she should be forced to enter into matricidal war.

The overwhelming success of the Iroquois campaign, taught the Eries that this new confederation of tribes, any one of which might be almost an equal match for her people and of whose personal prowess they had witnessed on the Chinisseo, a prowess and fame heightened by the masterful manner in which the rebellious Neutrals had been swept out of existence, inspired Gegosasa, her councillors and warriors with most anxious forebodings. To cope collectively with them, seemed to be now an impossible feat. The only hope of the Eries, therefore, lay in being able, by a series of subtle strategic surprises, to destroy the Five Nations in detail.

It was the year of 1655, that the Eries sent a friendly message

to the Senecas, who were their nearest neighbors, inviting them to select one hundred of their most noted athletes to play a game of ball against the same number to be selected by the Eries, for a wager that should be considered worthy the occasion and the character of the nation, in whose behalf the offer had been made. Now hitherto, the Eries had been the acknowledged champion athletes of the continent; in all hand and foot struggles they were unequalled.

The message was received and entertained in the most respectful manner. A council of the Five Nations was called and the proposition fully discussed, and a messenger dispatched with the decision of the council respectfully declining the challenge.

This emboldened the Eries, and the next year the offer was renewed, and after being again considered, again formally declined.

This was far from satisfying the proud lords of "The Great Lake," and the challenge was renewed the third time. The blood of the young Iroquois could not be restrained. They importuned the old men to allow them to accept the challenge, and the wise councils which had so far prevailed at last gave way, and the challenge was accepted.

Nothing could exceed the enthusiasm with which each tribe sent forward its chosen champions for the contest. The only difficulty seemed to be to make a selection where all were so worthy. After much delay, one hundred of the flower of all the Five Nations were fixed. An experienced chief was chosen as the leader of the party, whose orders the young men were strictly enjoined to obey. A grand council was held at Onondaga, and in the presence of the assembled multitude, the party was charged in the most solemn manner, to observe a pacific course of conduct towards their competitors and the nation whose guests they were about to become, and to allow no provocation, however great, to be resented by any act of aggression on their part, but in all respects to acquit themselves in a manner worthy the representatives of a great and powerful people, anxious to cultivate peace and friendship with their neighbors according to the teachings of Hiawatha. The party then took up its line of march to Teosahwa. When the chosen band had arrived in the vicinity of the point of their destination, a messenger was sent forward to notify the Eries of their arrival, and the next day was to be set apart for their grand entree. The elegant and athletic forms, the tasteful

yet not cumbrous dress, the dignified, noble bearing of their chief, and more than all, the modest demeanor of the young warriors of the Iroquois party, won the admiration of all beholders. They brought no arms. Each one bore a bat, used to throw or strike the ball, tastefully ornamented, being a hickory stick about five feet long, bent over at the end, and a thong netting woven into the bow.

After a day of refreshment, all things were ready for the contest. The chief of the Iroquois brought forward and deposited upon the ground a large pile of costly belts of wampum, beautifully ornamented moccasins, rich beaver robes, and other articles of great value in the eyes of the Indians, as the stake and wager on the part of his people. These were carefully matched, article by article, by the chief of the Eries—were won by the Iroquois, who bore off their prize in triumph. Thus ended the day.

The Iroquois having now accomplished the object of their visit, proposed to take their leave, but the chief of the Eries, addressing himself to the leader, said, their young men, though fairly beaten in the game of ball, would not be satisfied unless they could have a foot race, and proposed to match ten of their number against an equal number of the Iroquois party, which was assented to, and the Iroquois were again victorious.

The Kaw-Kaws, who resided at twenty-mile creek (Jordan) being present as friends of the Eries and umpires of the games, invited the Iroquois to visit them before they returned home, and thither the whole company repaired. The chief of the Eries evidently dissatisfied with the result of the several contests already decided, as a last and final test of the courage and prowess of his guests, proposed to select twelve men to be matched by the same number to be selected from the Iroquois party to wrestle, and that the victor should despatch his adversary on the spot by braining him with a tomahawk, bearing off his scalp as a trophy. This proposal was not at all agreeable to the Iroquois. They, however, agreed to accept the challenge with the determination—should they again be victorious—not to execute the bloody part of the proposal. The champions were accordingly chosen. A Seneca was the first to step into the ring, and threw his adversary among the ringing shouts of the multitude. He stepped back and declined to execute his victim who lay passive at his feet. As quick as thought, the chief of the Eries seized the tomahawk and

with a single blow scattered the brains of his vanquished warrior over the ground. His body was dragged out of the way and another champion of the Eries presented himself. He was as quickly thrown by his more skilful and powerful antagonist of the Iroquois party, and as quickly despatched by the infuriated chief of the Eries. A third met the same fate. The chief of the Iroquois seeing the terrible excitement which agitated the multitude, gave a signal to retreat. Every man obeyed, and in a moment they were out of sight. In two hours they arrived at Buffalo, gathered up the trophies of their victories and were on their way home.*

The visit of the hundred athletes of the Iroquois and its terrible results only served to inflame the jealousy of the Eries, and to convince them that they had powerful enemies to contend with. It was no part of their new policy to strengthen their power by cultivating friendly, or rather equal alliance, with any of their neighbors—they struggled to regain their ancient position as Arbitrators of the continent—the "Island"—as warriors, they must prove themselves "superior to all men." As a league, the Five Nations could not be dealt with, they must be destroyed in detail. With this view, a powerful war party was immediately organized to attack the Senecas. It happened at that time that there resided among the Eries a Seneca woman, who during the first war had been taken captive and been married to an Erie, he died and left her a widow without children, a stranger among strangers, and now sadly alone, her heart and thoughts naturally turned with longing towards her old home. Apprehending the terrible note of preparation for a bloody onslaught upon her kindred and friends, she formed the resolution of apprising them of their danger. As soon as night set in she started on her journey, travelled all night, and early next morning reached the "head of the lake," where she found a canoe fastened to a tree, she boldly jumped in and pushed out into the open lake. Coasting down the south shore of the lake she arrived at Oswego river in the

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*A parallel engagement between "Young Men" is found in sacred history, in II Samuel, Chap. II, Verses 14, 15, 16, beginning "Let the young men now arise and play before us." Let them arise." The place was called hereafter, the "Place of Strong Man." The chiefs arose and called out in a loud voice, "Treachery, Treachery."

night she was near to the town of Hon-ey-oye. She directed her way to the house of the head chief and gave him her information. She was immediately secreted by the chief, and runners were despatched to all the tribes summoning them to grand council. When they were convened, the chief arose, and in the most solemn manner, told the audience that a bird had appeared to him in a vision of the night, and that a great war party of the Eries was preparing to make a secret and sudden descent upon them to destroy them, that nothing could save them but an immediate rally of all the warriors of the Five Nations to meet the enemy before they had time to strike the meditated blow. These solemn announcements were heard in breathless silence. When the chief sat down there was one yell of menacing madness, and the earth fairly shook when the mass of frenzied Iroquois stamping the ground with fury, and brandishing high in the air war clubs, demanded to be led against the invaders. No time was to be lost, delay might prove fatal. A body of five thousand warriors was formed, with a corps of reserve of one thousand young men who had never seen battle. The bravest chiefs from all the tribes were put in command, spies sent out in search of the enemy, the whole body taking up a line of march in the direction from whence they expected an attack. Meanwhile, Erie scouts brought word to Buffalo of the approach of an armed force. Gegosasa, with over two thousand warriors besides women and children, took refuge within the palisaded fort or fortifications. This fortress, at present Buffalo, stood on a fine plain, and was surrounded by a high wall, formed of huge trunks of trees driven into the ground side by side, and wedged together. These were crossed within and without by smaller and longer pieces bound to them by bands made of split trees and wild vines. The whole was plastered with a kind of mortar, made of clay and straw stamped together, which filled every chink and crevice in the woodwork, so that it appeared as if smoothed with a trowel. Throughout its whole surface, the wall was pierced at the height of a man with loopholes, whence arrows might be discharged at any enemy, and at every fifty paces it was surmounted by a tower, capable of holding seven or eight fighting men. Whole villages were build of reeds and straw. These forts were built in quadrangle form and palisaded. The four sides were each four hundred paces in length from side to side, two other palisades divided it into separate

parts. As the Iroquois approached Te-osah-wa, two of the best chiefs disguised themselves in French military costume to frighten the Eries, and lead them to believe that the wonderful pale faces were with them. These advancing within hearing distance of the fort advise the Eries to surrender. "The MASTER OF LIFE fights for us," said one of the disguised chiefs. "Who is this Master of Life of whom you speak?" replied Gegosasa. "We know of no Master save our right arms and our hatchets." The assault commenced, the palisades were attacked on all sides, the Iroquois using every exertion to carry the Fort by storm without success, their warriors being killed as fast as they approached At length they resorted to stratagem, they converted their canoes into shields, and advancing under the protection thus afforded, they succeeded in reaching the foot of the entrenchment, using the canoes for ladders, they climed the palisades in face of the enemy, who, having exhausted their munitions, stood at last within their own fortifications "at bay" before the foe. Gegosasa, and one thousand of her warriors, disdaining to fly, and to afford, by a temporary resistance, time for as many as possible of her people to escape, now engaged in a terrible hand to hand and foot to foot engagement, the canoes gave passage way for continual reinforcements of Iroquois.

Intimidated by the boldness of the invaders, hundreds of the Eries fled Gegosasa and her women were secretly led from the fort, guarded by the Queen's body guard. An indiscriminate slaughter of men, fleeing women and children now took place. The blood of the victims ran as water. The vanquished Queen and a remnant of three hundred fugitive Eries collected together and recruited their energies, they retraced their steps in hopes of surprising the enemy on his way home from the pursuit of their fleeing brethren. The plan was well conceived, but failed in execution, Gegosasa and her noble "three hundred" were surrounded, taken prisoners and led captives to Onandaga, the Queen to await trial for her act of betrayal of the Sacred Trust, as custodian of the National Pipe of peace. Her judges were chosen representatives from the Nations which at one time had ceased war at her command, and whose ambassadors had at her Council House at Kieuka, on the Niagara ridge, yielded their will to the utterances of a "Mother of Nations." The council fires of the Iroquois Confederacy accepted the judgment of the Onon-

dagas, the senate of the Nations, which was, that the Erie Confederacy should be wiped out of remembrance, and their name obliterated from the number of the tribes of the Huron-Iroquois race. The memory of such a dynasty as that of Yagowanea, "Mother of Nations" was to be buried fathoms deep in the waters bearing their name, the Sacred Lodge of Gegosasa demolished and the Order of Vestal Virgins dispersed, the towns of Refuge covered up or reduced to ashes. The confederacy of Neutrality, instituted in the days of "Antiquity" by the ceremonial of the Pipe of Peace, was left with no monument to carry their name save the name of the waters of Erie. The embarrassments of the wounded and so many captives had detained the Iroquois nearly two months in the country of the Neutrals. The Niagara Peninsula hereafter was annexed as "Hunting Grounds" to the territory of the Iroquoise. The rapids of Niagara which for ages have rushed through forest walls and rocky flats, haunted by the rattle-snake, are still hurrying with impetuous speed over rough and stony bed to yield their quota of "smoke" to the ever rising heavenward incense of Niagara "in memoriam" of the broken covenant of the "peace and good will towards men," which once ruled over the Council fires of Central Canaiderada.

The legend is told among the Chippawa tribe, that before Nature sleeps, she clothes herself in royal robes of purple, scarlet and gold in all the glorious mystery of the Indian summer. At that season (October) the Chippawa came to Niagara to make their annual sacrifice to "The Spirit," which dwelt behind the rocks. They chose a victim from the loveliest of their Vestals—the one chosen by lot was sent forth in a newly made white birch canoe, clothed in a tunic of swans' skins, over which fell as a mantle the glory of a woman, her long hair, ornamented with wreaths of flowers, around her neck were hung strings of white Wampum—the sign manual of her people that this particular maiden was the victim chosen by the tribe. From the Chippawa shore she was sped forth on the seething rapids above the Falls, an offering to the Mighty Being, who also would draw to himself over the cataract, twelve for the one withheld, before as many moons should wax and wane. One autumn, the lot of sacrifice fell upon an aged sachem's only child, the sole comfort of his old age. He opened not his mouth, and was dumb under the doom of the choice, but to live without her he could not. When she was far out

on the seething treacherous waters, the canoe of the unhappy father shot like an arrow from the bank to join with his child in death. Thus father and daughter met again at the moment the terrible "smoking" caldron below arched over with innumerable irridescent rainbows claimed the double sacrifice.

"Ye say they all have passed away,
That noble race and brave,
That their light canoes have vanished
From off the crested wave.
That 'mid the forest where they roved,
There rings no hunter's song shout
But their name is on our waters,
And ye cannot wash it out."

NATURAL HISTORY NOTES.

Read before the Hamilton Scientific Association Oct. 3rd, 1899.

BY WM YATES, ESQ.

An autumnal outing to South Norfolk county in company with Mr. James Goldie, senior, of Guelph, about a week ago, gave rise to several incidents of seeming interest. The main incentive to the trip was the procuring, if possible, of some specimens of that rather showy, wilding litospermum hertum, which, at the height of the floral season in mid-June profusely embellishes many of the sand knolls that frequently dot the landscape as one passes along the concession roads or crossing roads, in the township of Charlotteville and in other localities of that botanically interesting district. A search over several of those "braes" at the time hinted of at the beginning of this paper, discloses the fact that the plants in question had matured their seed and that the rather rough akenes had allen to the ground; yet abundance of the bristle adorned leaves remained (unwithered), to make the plants easy for identification, and a dozen or more well rooted specimens were dug up by Mr. Goldie, to be reset among the floral curiosities of his extensive garden.

A similar removal (and in the same locality) was our next proceeding with ten or twelve specimens of the hoary wild pea, *tephrosia virginiana*. This, when in flower, is a pretty wilding and has entirely overrun many exhausted sandy fields. The roots of the tephrosia are interlacing and deeply penetrate the subsoil, this trait being a great vexation to the ploughman. The tephrosia is spreading extensively in those districts congenial to its growth and its, vetch or pulse-like, seeds are carried by rodents like the chipmunk and red squirrel and by mice, and get extensive distribution by these and the similar agencies of birds.

It was noticed during the course of our woodland perambulations that much of the forest garniture of the *viola pedata* had been denuded by the severe drought of the season, as well as perhaps by

grasshoppers ; yet about twenty well rooted specimens were removed to where they may not be so likely to "blush unseen" or to "waste their sweetness on the desert air." Another interesting shrub that was noticed, and seven or eight of its samples appropriated, was the *potentilla fruticosa*. About an acre of boggy pasture land was overrun by this rather rare shrub. Situate by the roadside, less than a quarter of a mile eastward from the picturesque village of Vittoria, this potentilla might easily be mistaken for one of the numerous species of St. John'swort, although the foliage of the former has a greater resemblance to some of the heathworts and has a very neat appearance but is pinnate (five to seven foliate) and clustered near the flower cymes. The tephrosias, too, are exceedingly handsome when in flower, with their yellow and red blossoms, the banners spreading and the stamens mostly in two sets, or brotherhoods, and seventeen to twenty-nine leaflets, hoary on the underside. We saw some patches of these flowers, an acre or two in extent, on waste land and the herb has rather a rank, unpleasant odour which protects it from being depastured by the groups of wandering bovines, which in the summer time are often allowed to wander to seek their subsistance by the roadside in the townships bordering on Lake Erie.

One of the farmers, who is a landholder, near the north shore of Lake Erie, told us that on the break up of winter, and as soon as the winter wheat fields are bare of snow, large numbers of wild geese alight on the green surface to nibble of the tender young wheat plants, and unless driven off by being fired at and chased, by gunners and riflemen, do much damage to the prospective crop, but as soon as the ice accumulations on the reedy and sedgy margin of the bays and inlets have melted and disappeared, the anserine visits to the wheat fields cease.

The farmer on whose land we dug up the lithospermums told us that a flock of forty or fifty wild pigeons came this fall to feed on his wheat stubble, and that they still live in the neighboring woods (this being a beedhnut year).

Dec. 4th, 1899.

What a remarkably fine autumn we have experienced. Blossoming dandelions abundant in the roadside grass up to the present date. Farmers about here are, some of them, working with team

afield to-day, although this morning there was about an inch of snow-fall which has nearly melted away, and batrachians have been hopping about among the fallen leaves in the woods and marshes within a day or two of late. We have only the regular winter bird residents to visit our shrubberies now, and the almost universal practice about here now is to cut up the corn fodder and pack the same in silos just as soon as ripe in early September, so the fields are clear of corn stooks, and in consequence few or no crows are seen or heard during the fall or winter season. Blue jays also keep more to the woods for acorns, etc., but frequent orchards too to regale on frozen and neglected specimens of apples and other fruit.

The long continued dry weather of the summer of 1899 has caused a great number of wells to fail to yield their normal supply so that the digging of new wells or else deepening the old ones has been in many instances resorted to in this district, and a more extended knowledge of the earth's surface-strata has been thus acquired. In these parts most commonly there are 4 to 6 feet of alluvium to be dug through ere the indurated or glacial clay layers are arrived at. These compressed and hardened deposits are found to extend to varying depths of from 20 to 40 feet or more, and to penetrate them, well sharpened mattocks or steel-pointed crowbars are a necessity, and the labor is sometimes nearly as severe as if logs of solid wood had to be pierced through. There are also numerous boulders of various species of rocks imbedded in the grayish or bluish clay beds, and occasional veins of thin layers of rather fine gravel are found at varying depths ; and these, at a depth of 20 feet or more, usually yield a more or less copious supply of pure water, but generally the most abundant and permanent water supply is met with when strata of quicksand of greater thickness than the above mentioned are met with.

Gravel veins or streaks are met with. Violent currents or watery tides must have existed here at the time of deposition of these superficial strata, as is evident in some spots from the contorted and undulated, and sometimes variously inclined or inverted position of the earthy masses. Judging from the varying depths at which the loose sand strata or percolating gravel veins are met with there would seem to occur a sort of " pockets " that have been filled in with the indurated clay or marl, and when such sites happen to be struck by

the well digger his efforts to obtain a copious water supply are frustrated; yet on fresh attempts with the same objects, at a few feet or yards distance from the scene of baffled labors, water bearing strata are met with much nearer to the earth surface. These facts are frequently made profitable use of by pretenders, or else experts, in the mysterious uses of the witch-hazel branches or so-called divining-rod.

In the alluvial or loamy superficial strata too, boulders of varying shapes and sizes are of frequent occurrence, even in thoroughly well cultivated districts, and the queries as to "the when and the how" of their arrival in their present "site" frequently arises in the minds of these whose interest is found in the removal of these time resisting masses to places where they may prove less hindersome, or perhaps of high utility, in the hands of the stone-mason artizan. These boulders vary as much perhaps in their chemical composition and graining as they do in shape and size or volume,—a medley of granite, gneisis, slaty-limestone and innumerable softer species of rock, with, at times, a superficial loose stratum consisting of unworn fragments of rock, containing fossil impressions, called "drift" mixed with rounded gravel and loam or sand. Workmen engaged in the digging out and removal of these boulders notice that the "big end" or heaviest end of them is usually undermost in the earthy matrix and that not infrequently specimens are met with a few feet or a few yards apart whose surfaces indicate that the two have once been united, as a fractured side has notches and ledges that fit in and seem to form a counterpart to answering unevenness in a contiguous fragment. We remember a member of our family, who on one occasion was busy disinterring one of these alluvial boulders of a rather unusual magnitude, and on being approached by a chance passer-by who at once noticed that the big seeming rock had a separating chasm of the width of 3 or 4 feet, compactly filled in with hard soil, asked his opinion as to the agency or power that must have caused the disruption and separation, he promptly gave the conjecture: "Why, lightning, one would think," having evidently not a vestige of a doubt that the two divorced objects had once been in unity. These common experiences give cogency to the surmises of geologists as to a flooded condition of the earth's surface on the

thawing and dissolving of glaciers which are supposed to have existed in the frigid epoch of the terrestrial development.

About 6 weeks ago several children returning from school in the evening spoke of having watched on the grassy lawn an assemblage of insects that one of the scholars termed "dancing flies."

Sometimes as many as eight or ten groups of these gyrating gnats are to be seen in the limits of a half acre field on a calm afternoon but more frequently in the autumnal season than at any other time of the year. The harmonious, gentle, rhythmical movements of the coterie it is impossible to look at without interest and wonder.

Each gnat moves in an orbit of a certain form ; a sort of elongated ellipse. There are hundreds of individuals or more in each coterie or fraternity, evidently inspired by a communistic aim ; as in the dance of the (so called) superstitious "Shakers." Like humanity the gnat activities for the occasion tend to one corporate aim and like the orbits of the asteroids there seems to be a common centre or focus and the original point of departure (disruption) is returned to. There is in all the mazy movement no real erraticism, but an evident pre-determined ideal, as in the spider's geometric web. The music, too fine for most human ears, but like the hum of the mosquito capable of expressing extremes of sentiment or emotion, is a low hum of vibratory wings, as the assemblage rises to its apogee or perigee, one or two feet, then simultaneously (like a swarm of bees) drops to the lower level or segment of the orbitual curve and thence gracefully ascends to the appointed altitude of the living garland.

How so frail an atom of life is perpetuated in spite of extremes of solar heat and wintry blizzards seems miraculous, yet their permanence and capacity for enjoyment is evidently as well assured as the elements, as the rocks and woods and running waters. These gyrating gnats seem to find food, shelter and protection (like the aphides) on the under mildewed surfaces of grass and wet leaves about fences, or under the shade of groves, and like their relative the mosquito it is likely that water puddles and marshy areas are their essentials for reproduction ; although another cousin (i. e. the wheat midge) is independent of the aqueous elements as a nidus for its larvae and finds a nidus in the delicate germs of wheat blossoms.

The destructive Hessian fly, too, appears to be a relative of the

tipulæ yet its larva destructively thrives and luxuriates in the hollow stems of the most valuable of our gramineæ.

The weather has, on the whole been mild for December and the two inches of snow seems melting away. A walk in our woods just at present seems a rather tame affair. Many youngsters roam through the forest with guns shooting at bird or quadruped or any wild creature that comes in range. This causes the victims' tribes to retire to the most difficult and inaccessible parts of the bush, such as cedar swamps and boggy thickets, where berries and similar food yet abound. The ilex verticillata bushes were loaded with crimson berries until a few days ago; now the frosts have caused many of the rich looking berries to fall to the ground, but a few of the hawthorn trees still have a showering of fruit and the hips of the wild swamp rose are abundant and are made more juicy and bird-temptiug by frost. The ilex (or prinos) verticillata is deciduous, but were the leaves, as also the crimson berries, more persistent this shrub would be one of the most interesting of Canadian shrubs.

NATURAL HISTORY NOTES.

Read before the Hamilton Scientific Association, Feb. 21st, 1900.

BY WM. YATES, ESQ.

We have had some very cold nights of late, frequently 5 or 6 below zero, but winter is gliding by. One day this month I think the 8th or 9th the thermometer showed 54 degrees and many hive bees came out of their winter quarters and numbers of the hymenopterous honey gatherers got death chills by alighting on snow patches on the ground near the hives.

One of my neighbors says he lately found a bee tree in the wild woods; the snow tracks at the foot of the tree showed that the bee stores were being stolen by red squirrels as there were pieces of broken comb fallen about the tree base. There was a crack in the tree bole gnawed for enlargement by the squirrels.

True to the record the horned larks returned here on the first February thaw, after an absence of three months or more. They are now to be seen (and heard) on the highways and margins of stubble fields, enlivening the scene in groups of eight or nine, showing, as Emerson writes:

> "Far reaching concords of astronomy,
> Felt in the plants and in the punctual birds."

One of my neighbors says he has been lately petting a hairy woodpecker—P. Villosus. It lives in the hollow stem of an old apple tree near to his house. He hangs on the tree a piece of beef bone with some of the fat meat left on.

The bird, he says, comes out of retirement once in two or three days and gorges itself on the food store, goes back into the vegeative dark cave of Adullam, and is seen outside no more until hunger compels or suggests another outcoming.

Many blue jays come about almost daily to eat the seeds of frozen apples left in a few instances scattered on the leafless branches. Mr F. Bowles, a New England naturalist, says (and it is true) that

one of this bird's most common notes sounds like the syllables "roly-oly" three or four times repeated in momentary intervals.

The snow bunting appears to be more of a denizen of semi-barren moor land and of level plains and fields where weedy leas and waste margins of tillage at the boundaries of stubble are of not infrequent occurrence. The flocks of this species of bird have, we think, been more numerous this winter than usual, i. e. a greater number of small flocks, say of from fifty to eighty birds instead of the occasional large flocks of a thousand or more, and it is noticeable that the flocks in their restless journeying movements, avoid extensive wooded areas; their food being found in the dried capsules of the tall weeds that tillers of the soil are unable utterly to exterminate, and whose cymes and panicles and umbels the wintery snows hardly ever entirely submerge. The fact of the snow buntings being usually quite fat all through the season when they are met with here would seem to attest the abundance and rich quality of the customary food. Their frequent and chirrupy calls to each other as the straggling groups move forward from clearing to clearing, and the hurried flight which the few chance loiterers evince, in order to join the main body of their congeners, demonstrates the strength of the socialistic tie, and that they love to continue in sight and hearing of each other. The same communism is seen in their roosting or bivouacing habits, the flock huddling together at nights under the eaves or in the recesses of a straw stack or on the ground in the thick shelter of low bushes of evergreens. The sparrows and grackles have also the same instinct of close association during the hours of darkness.

The recent capture of a lynx in an extensive cedar swamp a few miles from here brought to notice the question of the origin of these ferocious and somewhat overgrown editions of felinæ and the probability of their being merely expanded instances of the domestic cat. There are many instances on record where house cats have been driven forth from the settlers' household, and of these outlaws having grown, during their wild predatory life, to a size much greater than that of the tame cat.

One such instance is remembered in this neighborhood where a certain grey grimalkin attained gigantic proportions, and rambled about the woodland neighborhood a terror to the majority of "stay-

at-home" felines. This bush ranger frequently visited poultry coops during the night in the role of an egg-stealer, and also had a habit of killing kittens in the maternal nests, and fiercely overpowering the said kittens' natural defenders. In an instance that was well attested, one of these tramp felines visited a dog kennel wherein were a litter of puppies with yet unopened eyes and in wantonness slew the whole of them!

The striped marking on some grey household cats are about as well defined as are those on Mr. Lynx, and the white or black spots on the end of the tail is no indication of a generic difference, as the same occurs at times in house cats. Then the tree climbing habit, being much extended in pursuit of bird or squirrel prey, and necessarily increased activity in habits and food hunting instincts, must tend to an increase of bodily size and muscular development.

The fact, too, of the common minx having usually a small white spot on its body, and the peculiarity of the situation of the said white mark being usually near the base of the lower jaw where it is most likely to escape observation, gives a wide field for conjecture as to the wherefore and design of such symbolism. This small spark of albinism brings to mind a story that was very current in these parts four or five years ago, that some boys in an adjoining township had captured a family of young white racoons, four in number. To what prenatal influence could such extraordinary phenomena be attributed? The word "freak" seems unsatisfactory and not quite conclusive, though there is an instance near here of albinism having seemingly become hereditary in poultry, for one of our acquaintances possesses a flock of white guinea fowl which are prized and admired on account of that eccentric trait.

Some time ago the writer of this was asked to give an opinion as to the agencies of production of a peculiar boulder or agglomeration of fragments of rock found near the surface of a neighboring field by the operation of the plough. The object is about the size of a bushel measure and would probably weigh 160 pounds. There is a mass of various fragments of rock cemented in a firmly cohering mass, as if angular pieces of rock of varying size and geologic age and structure had been held in a frame, mould or crevice promiscuously, and then a semi-fluid geologic "porridge," evidently

not in a state of fusion but aqueous, had under pressure perhaps, been forced all through the mass, leaving no interstices.

The effect produced is as if an unsymmetrical piece of encrinal limestone had been smeared with a thick coat of adhesive mortar and then rolled over a layer of broken stone or gravel, some pieces angular, some rounded at the corners, some pieces of quartz, some gneiss or granite, others Trenton limestone drift, cohering in a mass as if brown cement in a condition like " batter " had hardened about the mass.

Some apprehensions are beginning to be expressed as to the too reckless process of deforestation that is now going on. When the woods go many birds will go also. This assertion is even now being made plain.

The chicadees, like the European robin, sometimes come about farm dwellings to obtain food, bnt they show great fear of the shrike destroyer that is increasing in numbers and makes prey on many small species of birds. The chicadees come to our neighbors' kitchen doors now every day in parties of three, four or five, for crumbs and small pickings of food.

April 4th, 1900.

Despite of the frosty nights and cold blustering winds of the daytime our red-breasted feathered acquaintances, the robins, were heard in our orchard trees singing their blithe notes just after sunrise on the morning of the 21st March, and on the day following, when the weather had become somewhat warmer. Blue-birds were present in the wood margin in considerable numbers, and made the leafless groves musical wherever there happened to be a sheltered or sunny exposure. The food of these early arriving birds seems to be principally the gray or brown moth that hybernates in the crevices and under the surfaces of the scaling off strips of bark of the sugar-maple and of the elm or other large forest trees. A few hours of sunshine about the beginning of March, or even at the ending of February, tempts these lepidoptera forth from their winter retreats, and often at that period of the year the gatherers of maple sap find numbers of the moths drowned in the sap of the receiving pails, as the weak saccharine aroma of the dripping fluid seems to possess a

dangerous fascination to various insects, such as the smaller moths and two-winged flies as well as to the species of wild bees, etc., and the blue-birds are occasionally seen to dart into the fluid sap contained in the brimming pails when chasing the moths or to seize the latter, as a tasty food morsel, as the insect in a half drowned condition struggles and flutters in its dangerous bath. But should a protracted cold spell occur, as sometimes happens late in April, the insect tribes stay in their retreats, and numbers of the robins die of hunger, and are found in an emaciated state under the barn floors or in open hay sheds. Usually of late years the moths (that are mostly the imago of the tent caterpillar) and are so numerous and ubiquitous in the forests and orchards that various species of birds obtain an abundance of food before vegetation has made any progress visible to the eye.

The phoebe flycatcher, too, is an early arrival, and has been noticed in the sugar bushes for the past ten days, and frequents the outbuildings about barns in quest of spiders and their ova, which are abundant about the rafters and interior frame timbers of the cattle byers and similar structures.

The song sparrows' refrain too is heard at as early a date as the note of the blue-bird. A few of these grass finches were heard and seen early as the 23rd March, and we suspect a few have stayed near dwellings about here during the whole of the past winter, finding food and shelter about the long grass, well protected by the low branches of evergreen trees and shrubs that grow about the farmers' homes.

The kill-deer-plovers come around as soon as there are pools of water in the depressions of the fields, the result of the first decided thaw, and the cries of these birds are now daily heard, and the occasional refrain of the meadow lark also. Those engaged in the manufacture of maple syrup say that a few grackles have been seen.

The indications are that the spring will be a late one. It is quite cold and March like to-day, and there has been but a very scanty run of maple sap so far. My son tells me that he heard the first faint piping of frogs in the swamp to-day (April 4th, 1900), and there is much ice and the remains of snow drifts in shaded parts of the woods yet, and there seems to be no likelihood of spring flowers for at least a week to come.

ANNUAL REPORT

OF THE

GEOLOGICAL SECTION

OF THE

HAMILTON ASSOCIATION

For the term ending May, 1900.

HAMILTON, Ont., May, 1900.

The section has much pleasure in submitting this its annual report, satisfied that substantial progress has been made in the collection of fossil specimens, and also that a greater knowledge of the field from which to collect fossil specimens has been acquired by those members of the Section who devoted their time to such work.

During the past year a large number of specimens have been added to the museum by Col. C. C. Grant, Mr. J. Schuler and Mr. H. T. Bartlett. Some of the species are new to the collectors of this locality. Numbers of these newly discovered species have been sent to experts for identification.

Special mention should be made of the discovery by Col. C. C. Grant of two species of Septobolus because of their rarity; only three of this family having been described by the late Dr. James Hall, Geologist of New York State, as occurring in the lower silurian rocks in America. Some varieties of Septobolus have been found in the the Niagara chert beds near Hamilton, these beds form part of the middle silurian series of rocks.

During the autumn and winter months a rearrangement of the fossils in the cases was made with the object of having a fuller representation of the characteristic specimens more readily obtainable for the purposes of study by those who choose to avail themselves f the opportunity. Also with the view of economizing space so as

to make room for the constantly increasing number of fossils being added by the different collectors.

Col. C. C. Grant, the most indefatigible member of the Section, has spent nearly the whole time at his disposal during the past year collecting fossils and data as to the different horizons whence certain organic remains first appeared on their stage of existence.

Many of the duplicate forms of fossils have been sent to the principal museums of the world, notably the British Museum, Washington Museum, Dublin Museum, and others, including our own at Ottawa and Montreal. The recipients have expressed their great pleasure and thanks for these donations. The fossil sponges are subjects of great interest to the professors in science who visit the museums containing these specimens.

Our museum has been kept open to the public on Saturday afternoons during the past year, so that the student of science could have an opportunity for comparative study, and gather such information as would be helpful to him in his special or general study, whether he took up the Geological, Palaeontological, Mineralogical Archaeological, Botanical or Conchological branch, and the Section is pleased to be able to place this fact on record, that qnite a number availed themselves of the opportunity.

The Section had hoped that before submitting this annual report it could have been placed on record that more commodious quarters had been secured for the better display of our already large and overgrown collection. Also, that instead of a few members who evince an undying interest in such a good work as the Hamilton Association is promoting, that the citizens of Hamilton generally would have taken hold and given us such assistance as would gladden the heart of the most pessimistic member of the Association, and at the same time have added another important attraction to visitors to this beautiful city, viz., a public museum.

Papers of interest were read at four of the meetings of the Section, two on geological topics, and two on malacology. The latter dealt with a few of the families represented in the museum, and one of the papers alluded specially to the fresh water shell, such as are found in the lakes and rivers of North America. Comparison was drawn between the fossil and the living types.

Following are the dates of the meetings at which papers were read, and the subjects:

Dec. 29th, 1899, Palaeontological, Geographical and Topographical notes, by Col. C. C. Grant.

Feb. 23rd, 1900, Fossiliferous localities, by C. C. Grant.

March 30th, 1900, Malacology, by C. C. Grant.

April 27th, 1900, Malacology, by C. C. Grant.

All of which is respectfully submitted,

A. E. WALKER,
Chairman.

A. T. NEILL,
Secretary.

OPENING ADDRESS.

Geological Section for Session 1899-1900.

BY COL. C. C. GRANT.

Owing to the state of our President's health, who unfortunately is unable now to take an active part in each year's fossil collecting expeditions, as well as the other employments which prevent members of the section from adding many specimens to the museum cases, as the only idle member of the community available, the duty devolves on the writer of laying the result of what has recently been obtained before you. With regard to the field geology of the district, there is little to communicate. We are all aware of the slow elevation or depression of the Earth's crust which has taken place recently at various sea-coasts. It was only within the last quarter of the century that similar changes were pointed to as occurring in our lake regions now by Professors Gilbert, Spencer and others. In a paper by the former, the writer lately received, entitled "Recent Earth Movements in the Great Lake Region," he credits Mr. Stuntz, land surveyor of Wisconsin, with being the first to notice these oscillations in or about Lake Superior. But the Earth movement or tilting up of its crust referred to in Professor Gilbert's work, and which Dr. Spencer, F. G. S., asserts is even now going on, does not appear to be confined to that portion of the continent, and the writer recollects, that Dr. Bell, of the Canadian or Dominion Geological Survey, brought forward several years ago very strong proof that considerable changes had recently taken place in or about the Hudson Bay District; and perhaps some of the members may not have forgotten the writer also stated on his return from Anticosti, that he had ascertained the sea-bed was undoubtedly rising at the principal station there, "English Bay," and probably along the south shore of the island.

No more need be said regarding the more general movement, but the alleged disturbance or tilting of the northern shore of Lake Ontario brings the matter close to ourselves, and as in former years, when I stayed at Winona during the past summer, I paid particular attention to the lake level, noting minor changes at some points and considerable ones at others, and still entertaining the views expressed in a former paper, viz:—that Lake Ontario was certainly encroaching on the south shore. This was not perceptible on a first glance from that portion of the park where I was standing, but on looking and taking in a wider range along the lake westward (only a slight breeze was blowing at the time), I saw the water level was considerably higher than it was the previous year, in fact, one found it impossible to get along the shore dry-shod, where no difficulty was experienced at the same time last year in walking below the high bank. A little to the west between Winona and Hamilton, a farmer assured me the lake was encroaching on his land, and he lost at the rate of four feet, on an average, annually. At the park itself and to the east beyond it, a very slight change has been remarked in the lake level. Owing to an alteration in the current, the prevalence of winds in a particular direction, or other cause, the sand-bank at the margin is increasing and forming a barrier to the advance landward. A line of heavy boulders from the fields above, around which the gravel accumulates, may further retard the progress. A few placed by the writer by way of experiment, were not removed by shore ice in spring. He was informed, however, they would probably be taken away in boats for building purposes.

The Erie clay, capped by a slight covering of surface soil, is a stiff, greasy deposit, containing many polished and striated pebbles and boulders. In certain places it offers considerable resistance to wave action, but in hot, dry weather, the face exposed to the sun's influence, disintegrates more quickly than one may imagine. The frost penetrating above, aided by this weathering process, keeps the bank (20 feet in one field, as measured) quite perpendicular, It seems evident from this circumstance, hat while the water is sapping below, the weather-

ing does its own share of the work above. If the land proprietors along the margin foolishly permit outsiders to remove gravel, boulders, etc., as they are now doing, thereby assisting in the progress of the destruction of their own farms, they deserve to lose them. The writer was much pleased to find the following extract in a Canadian daily paper, because it proves the press has its eyes open to geological facts, viz :—

THE GREAT LAKES OF NORTH AMERICA.

"Recent observations prove that a large part of the region around the great lakes of North America is being raised or lowered in consequence of the action of the Earth's internal forces. Dr. J. W. Spencer has given reasons for believing that the land to the north is rising so as to make the waters encroach on the southern shores; and now Professor G. K. Gilbert has proved by a series of careful measurements, that the broad lake-bearing plain is being slowly tilted up in the north-east, and down in the south-west. In consequence of these changes, the water of Ontario is encroaching on its shores, the estimated rise at Hamilton being six inches per century." Now, we understand, we have quite a number of superior people in Ontario who are ready to assert that the statements of such well-known scientific men as Gilbert and Spencer are sheer nonsense, that it would be quite absurd to believe the solid continent is undergoing the changes indicated. You will usually find the individuals of this class are the least observant members of the community, whose vision hardly extends beyond their own shadows. The rainfall may vary annually, and some years may be productive of heavier snowfalls than others, it is said. This is well known. Admitting that it is so, it does not affect the tilting of the lake bottom, proved by actual measurement of the United States engineers. Mr. A. E. Walker informed the writer when he came to Hamilton, hardwood trees were growing at the Beach, where now they could not possibly exist, and we may add, the *Indian Ossuaries* (burial pits) there were found to be submerged on two occasions when visited in different years.

PALÆONTOLOGY, LAKE SHORE, WINONA.

Nearly five or six weeks the writer was engaged in collecting Cambro-Silurian and Niagara, etc., fossils, at Winona Park and Grimsby during the past summer. Although failing to obtain a particular specimen not in possession of the Dominion Geological survey office for Professor Whiteaves, a large number of other fossils rewarded research, including several not mentioned by the late Dr. H. A. Nicholson in his report on the "Palæontology of Ontario." Perhaps the best preserved ones occur in a reddish-brown flag, more readily opened under the hammer than other layers along the lake shore there. I never noticed this bed in *situ*, in Ontario or Anticosti; it is exceedingly fossiliferous, containing several shells which are common to the Trenton and Hudson River (Bala) beds as pointed out already. Here we have the usefulness of the term "Cambro-Silurian," of the English Geologist. "Drift fossils," without explanation, would be highly objectionable, for they may be of any age.

A considerable amount of the rock material along the lake shore has been derived from the "*Erie Clay.*" The scratched and polished surface proves glacial markings precisely like some dozen slabs extracted from its base above the lake level. In some cases, when they yield to the hammer, (they seldom do so) you may find organic remains. Only the hardest and toughest portion of the rock-imbedded, could have resisted the glacial grinding in "the ice age." This may account for the difficulty one experiences in extracting fossils from the material on the lake shore at Winona. Although many specimens were obtained, only a few are new species, probably. As we do not possess the earlier works of the late Dr. Jas. Hall, and other United States palæontologists, for the necessary comparison (in the absence of the fossils themselves which they describe) there is much difficulty in determining them.

Some fine slabs, very fossiliferous, were collected for the Public Schools and private individuals who take some interest in organic remains, and since my return to the city some

twenty or more small parcels were forwarded to the Dominion Geological Survey Office, Ottawa. No fossils along the lake shore, to the east of Winona Park, attract the attention of even the casual visitor so much as the numerous Monticuliporoids. Some are unusually large for this class, as you may perceive from a few selected for an upper case in the Museum. Much difference of opinion still exists regarding their classification. The late Dr. H. Alleyne Nicholson states "their zoological affinities are yet doubtful. In many of their features they show marked relationship with the *Actinozoa* generally, and with the *Alcyonaria* particularly, while in others they approach the *Polyzoa*." On the other hand, Prof. G. B. Simpson, a well-known authority on this continent, places them with corals, thereby differing from Rominger and others. Although few new fossils were collected during the season along the lake shore, some rather rare ones were obtained. Perhaps the finest is a specimen ot *Cypricardites* (Cyrtodonta of the late Professor Billings). Until I compared it with the figure and the description I imagined it might prove to be the *Cyrtodonta Hindi*, named from its discoverer and found near Toronto, and which the palæontologist stated was the only one known to him. It does not apparently agree either with that or any member of the family from the Hudson River rocks of Anticosti, and probably may be considered a new species. Another interesting fossil of the drift may prove to be the *Conularea Gracilis*—Hall—of the United States Trenton beds. Without the original or its correct figure it would be unsafe to rely on a description at any time. For the same reason one may hesitate to name a Pleurotomaria, a Modiolopsis with a beak like *M. Nasuta*—Conrad (the latter was transmitted to Ottawa in one of twenty-two small parcels received since my return to Hamilton). Every year the hunting ground for drift fossils becomes more restricted, as buildings are erected in the city on the ancient lake beach or ridge which runs through Hamilton. Even the road at the Desjardins Canal is now closed, and the material for its repair is no longer required, which was formerly obtained from the overhanging cliff. A

visit to the locality recently proved to be merely a waste of time. In fact, nothing remains to a collector but the modern beach, lake shore, and perhaps the Slabtown gravel pit, if worked at present.

GRIMSBY QUARRIES.

The Niagara shales this season presented nothing new, and with the exception of *Stephanocrinus Augulatus*, no crinoids put in an appearance. The thin limestone layers, so rich in bryozoans, were few and far between, and only one rare specimen, *Eichwaldia*, rewarded a three days' search there for specimens. However, the upper green Clinton band furnished a considerable number of slabs containing remarkably well preserved examples of Dr. Jas. Hall's *Fucoid* (*Arthrophycus Harlani*), or a closely allied species, which may prove to be a variety of this singular sea plant.

THE CITY QUARRIES

furnished very few specimens during the past collecting season, although more than the usual quantity of road metal was removed, especially from the one at the head of "The Jolley Cut" known as "the corporation quarry." From a small portion of the Niagara shale not removed, Mr. Schuler, a recent member

of the Association, extracted what I believe to be a new sea plant. It certainly bears a very marked resemblance to the Clinton Graptolite (*Retiolites Venosus*), but the branchlets are more horizontal, longer and somewhat drooping at the extremities, not black, but the stained impression can be easily distinguished in the matrix. The discoverer of this interesting specimen presented it to the Museum. The writer, a little before this discovery, found in the same material which had been dumped into the Hancock quarry adjoining, the transverse section of the expanded portion of a very large segment of Professor Ulrich's Bryozoon *Sceptroporafacula*, which is now in the Redpath Museum, Montreal, together with a specimen of Schizotreta ovalis from the Niagara limestones of the same place. Both fossils appear to be unnoticed in Canada previously.

The Niagara Chert beds and limestones this season (*in situ*) were rather disappointing, but the old reliable field at the corporation drain made ample amends for this deficiency, as you may perceive, perhaps from the collection submitted for inspection which represents merely a portion of the specimens obtained from what we have named "The Glaciated Chert Beds." It may be necessary here to state the beds so-called represent about eight feet of the Niagaras at the brow of the escarpment near the city, which disappeared during "The Great Ice Age," but may be seem at the rock cutting on the railway a little beyond the resevoir. Eastward of the bluff which overhangs the Grand Trunk Railway (now closed to scientific research) you may notice a farm house with a young orchard. The field beyond the latter has for many years been a favorite hunting ground of mine for chert sponges and sections; in fact, it is where the late Dr. James Hall was informed by the writer we would probably find many specimens in the place I pointed out. However, as he seemed to be incredulous in the matter, and probably entertained doubts regarding his companion's sanity, it was considered necessary to explain the reason for this assertion with which he seemed satisfied. The two fields beyond were clear of brushwood and brought into cultivation within

the past few years ; the lumps of chert have had insufficient time as yet to weather, but a considerable number of the sections of sponges were obtained close to the outlet of the corporation drain. Not far from the Albion Mills there is a small patch of swampy land which afforded me some well-preserved flint-flake chert fossils.

Organic remains, Hamilton, not recorded as occurring here, obtained during season 1899.

Winona, *Cumbro-Silurian* drift ;

Conularia gracilis.

Cyrtodonta, 2 species.

Monticulipora, species.

Medina, Hyatilla Congesta, Clinton crinoid (N. S., probably).

Niagaras and Chert beds : several new sponges and sections ; Certocephela—Warden ; Cornulites Clintoni ; Cornulites, 2 species ; Murchisonea (N. S., probably) ; Acidaspis ; Leptobolus, 2 species.

The only three of this family known were described as occurring in lower Silurians, by Hall. Their discovery in our local chert beds may be of interest to Palæontologists. Whether they are new species or varieties, in the absence of the described originals, cannot be determined. These I have not seen figured.

Note.—The list here given is incomplete. Other specimens, supposed to be *new species*, have been forwarded to experts for decision, and some fossils, rare with us but previously discovered in the United States, were obtained and sent to the Dominion Geological Survey office; Ottawa, as well as to the old country.

FOSSILIFEROUS LOCALITIES NEAR HAMILTON, ONT.

BY COL. C. C. GRANT.

A few days before starting for Winona Park last summer, I received a letter from Dr. Ami, Assistant Palæontologist of the Dominion Geological Survey, requesting information on the above subject, and in reply I stated that it would be furnished on my return to the city. I regret the matter quite escaped my recollection until recently, and although I believe what the doctor required would be found in scattered papers already published by our Association, we cannot expect officers of the Survey (overworked as they are) to wade through several years' proceedings to acquire such information. Now as members of the Section who recently joined are necessarily unacquainted also with localities previously indicated for organic remains, it may be advisable to collect for reference what was formerly written into a smaller compass despite a disinclination to repeat a story already told.

MEDINA SANDSTONE.

The quarries to the east of Hamilton, lying close under the Niagara escarpment have been nearly worked out. One, however, was reopened of late years at some distance, aud I have been informed there is reason to suppose the two near the city Reservoir which furnished me with Fucoids and other fossils formerly, would probably be again used for building purposes. If this can be relied on, a thin layer resting on a slight deposit of muddy shale lying between two sandstone beds of considerable thickness should be investigated. It contains plants, corals, gasteropods, brachiopods, etc. The upper surface of a massive grey band layer in an abandoned quarry near the city afforded me a Stromatopora, while the under surface of another a little beyond displayed the only *Orthoceras* noticed in the

"Medina series." A good many years ago a stone cutter pointed out to me a Favosites which his chisel revealed (to his intense disgust, as it ruined the slab intended for some ornamental purpose).

CLINTON ROCKS.

In order to get at the Medina sandstone, a considerable amount of Clinton shale overlying must be removed. This material after some exposure to the weather proved highly fossiliferous. Formerly the rubbish heaps extending from the foot of the Jolly Cut road to some distance beyond, were well known hunting grounds to the late Professor Wright, Mr. A. E. Walker, and the writer. Although much depends on the alleged re-opening of the sandstone (Medina quarries), more or less of the Clinton beds overlying are brought down annually by frost, heavy rains, etc., in minor landslips. During the past summer a Crinoid was obtained form this debris, in addition to a few fine lower Clinton slabs, containing Hall's Brachiopod *Lingula Oblata*, which occurs in one of the layers holding the well-known Fucoid *Buthotrephis Gracilis*, and varieties which may be looked upon yet as detached lower branches of the plant. Some few years previously the scattered plates of a starfish (derived from the iron band probably) put in an appearance in some shale which had fallen from an old quarry close to the eastern incline. The material near its foot (derived from Clinton beds, although insufficiently weathered) when examined during the past autumn displayed a few fossiliferous slabs.

The same may be said also of a rubbish heap, removed from a quarry recently re-opened for a short time close beside it. The peculiar marking on the edge of the flags, which indicated the presence of Fucoidal remains in the interior, requires close attention. This may be noticed at several points along the old quarries, and owing to the sloping banks of shale, one may easily reach these *in situ*, but their removal from thence, unfortunately, is no easy matter, as it entails much patience and hard work to displace the layers above them. When the upper reservoir above Judge Robertson's was constructed, by a

careful examination of the rocks removed, and the shale dumped on the slope near the Jolley Cut road, quite a large number of fossils were found. The iron band at this point, and lower Clinton green shales, presented several specimens not noticed at other similar horizons. The *Lingula Lingulata*, a Brachiopod, described and figured by the late Dr. Jas. Hall, from the former, was very numerous in a massive block which required to be broken up by the sledge. It appears to be confined to this particular place near the city. Three Graptolites occur in the shales below, which the writer has never noticed in the Clinton elsewhere. The Fucoids there are in rather poor preservation with one exception, in an instance where the plant was converted into iron. The specimen is now in the Redpath Museum, and pronounced a plant by the late Sir W. Dawson.

The upper green band (so rich in plant remains at Grimsby) contains merely a few ill-preserved *Lingulæ* at the Jolley Cut road, but fair specimens of *L. Clintoni* were to be had in the ravine below the Mountain View Hotel before the Incline Railway was placed there, and many organic remains, including the best preserved internal casts of *Pentamerus oblongus* yet discovered in the neighborhood of Hamilton. A quarry close to the hotel, not worked for some years for macadamizing material, afforded several Graptolites (*Dictyonemas* chiefly), bearing a greater resemblance to Quebec—lower silurian ones —than any seen in the city and adjoining quarries. One presented close bars connecting the branches at or rather near the base, gradually widening at the centre and becoming smaller towards the extremity of the branches, before it became embedded in the olden sea bottom. If only fragments of this single specimen were found, a palæontologist may well be mistaken for looking on them as representatives of distinct species.

I have been informed that the city will require a large quantity of stone as road material from the quarries at the head of the Jolley Cut road this year. Most probably the lower limestones, known in the States as the old Clintons (the best suited for the purpose), will be broken up for the crusher,

Our knowledge regarding the fossils contained in these massive building beds amount to very little, since an opportunity is rarely afforded of examining the interior. The Pentamerus bed at the base, which long ago attracted our attention here within the last few years, presented several fossils it was not credited with previously, and the limestone layers between it and the Stricklandinia beds, known to us hitherto as the barren Niagara limestones, have shewn they may now repudiate this misnomer, and if we can form an opinion from ill-preserved specimens we need not feel surprised at discovering a few more new specimens yet in addition to the ones which were recently found at the city quarry.

The Niagara shales here seldom display Graptolites worth taking ; in general the muddy layers crumble away in which they are imbedded. This is the more to be regretted since we find them more perfect than many obtained from the overlying blue building beds or "chert."

The fossils in question are chiefly obtained in the upper or second layer of the former, the Glaciated beds of the latter, and the one known to us as the thick Graptolite chert bed. It is about six feet from the top at the brow of the escarpment when the surface soil, etc., is removed. Owing to the dip of the rocks here (about 25 feet in a mile) you must expect to find the horizon a little lower as the quarrying proceeds inwards. True, you may find an odd specimen at other levels besides the ones indicated, but they rarely put in an appearance. I was quite surprised to see two at the base of the chert recently. Both have been described already. The outlook for the collecting season of this year is very discouraging as regards the Medina sandstones and overlying Clinton rocks. Yet the Geological Section may be compensated for that by future discoveries, more especially in what we call the Glaciated chert Niagaras, rich in Graptolites, in Bryozoons and Hexactimelid Sponges, Brachiopods, etc.

The distant quarry at the head of the Jolley Cut has hitherto displayed very few fossils ; that may be to a certain extent, owing to the chert beds there being much decayed. The Erie

clay is absent at the brow of the escarpment, the great protecing agent of the banks further inward. I believe a colony existed there of that rare Lingula, "*L. Ingerus Spencer.*" I succeeded in extracting one during the collecting season in good preservation and fractured two others. They were not seen *in situ*, but probably came from a middle layer in the Niagara chert. It is said the owner has lately permitted the corporation to use the upper beds for macadamizing purposes.

GLACIATED CHERT FOSSILS.

The writer secured an unusual number of sponges and various organic remains during the past season. Since his return from Winona several fields along the corporation drain had been ploughed up and planted with Indian corn, and in consequence of a long spell of dry weather the crops failed. Where not planted in rows, in some places, particularly near the drain and school-house on the Barton road a little beyond the Wentworth Hotel, the conditions were exceedingly favorable for collecting, although more weathered chert, flint-flakes, etc., appeared on the surface than was previously noticed. Perhaps not many new sponges or sections were discovered, but the ones we forwarded to the British Museum were in good preservation, and the same may be said of all specimens forwarded to England from this locality. The lands near the road at the top of the escarpment, a little beyond the city reservoir, were rather disappointing, although a few good sponge sections were obtained there. Some fields have been closely searched for years by fossil hunters, but in others the timber has only been lately removed, and insufficient time has elapsed for the weathering process to remove the outer covering which conceals the Spongidæ. The swampy part of a field not far from the outlet of the corporation drain, displays quite a number of flint-flakes, which hold very few fossils.

The Barton Niagara shales overlying the chert may be recognized in the rising ground a little to the west of the corporation drain. The ridge has been under grass for many years, but formerly held several sponges, corals, lingulidæ,

lamellabranchs, etc. When pointing out to a new member of the section, who lately joined our Association, places where fossils would be likely to reward research, my companion, Mr. Schuler, had the good fortune to secure a good specimen of "Uncimulus Striklandi" (Sowerby). Its occurrence in Ontario has not been noted by Schuchert or Nicholson, I think. Years ago the writer put in possession of the Dominion Geological Survey one which he supposed to be identical with *Rhynchonella Tennesseensis* (Roemer). The upper portion of the Barton series (lime ridge limestones in rear of the Mountain View Hotel) presented nothing new, and the Stromatopora corals are difficult to extract from the upper layer. The middle portion or water lime beds at or above the Albion Mills was visited only a few times during the past summer when no species unknown were obtainable. The writer believes the rock cutting on the T. H. & B. Railway, beyond Stoney Creek, has not yet been examined by our local geologists. The Niagara shale at Grimsby, where many Crinoids, Bryozoons and some Star Fishes occur. The upper Clintons there—rich in plant remains—the lake shore lower Silurian shingle and drift limestones between Winona and Grimsby are well calculated to attract the collector's attention.

A CYRTOCERAS FROM THE NIAGARA CHERT, HAMILTON.

The specimen recently obtained bears rather a close resemblance to a gigantic one found some years ago in the Barton bed above the Albion Mills, undescribed probably. It does not appear to agree with any fossil described or figured among the Niagaras of Hall or Nicholson. Although unusually large for a chert fossil, it may be only a dwarfed sample of the Barton Cyrtoceras referred to.

MALACOLOGY—CONCHIFERA.

BY COL. C. C. GRANT.

Read March 30, 1900.

It may be noticed that the writer in a former paper already published in our proceedings, omitted to refer to the Teredo, the very destructive ship worm, which at one time was looked upon as a univalve also.

The shell in question proves to be a true Conchifer, with the valves enclosed in a calcareous tube. It is said to have been introduced into Northern Seas from the Indian Ocean, but this statement seems very doubtful. We have reason to believe the eastern one, which is said to attain a length of two feet at times, may prove to be quite a distinct species, and it appears improbable that a Mollusc inhabiting tropical seas would increase to such an extent with uncongenial surroundings in the course of a few centuries. A shipping agent at Halifax, Nova Scotia, informed the writer that he had known an instance of a complete destruction of the hull of a sailing vessel in harbor, either there or at Quebec, in a few months after she was launched, by this sea pest. The *Gastrochena Aspergillum*, or watering pot shell, is also a Conchifer. A fine example may be noticed in Mrs. Carey's collection. Woodward separates the *Tubicolidæ*, of Lamark, from the *Pholadidæ* (it may be on insufficient grounds), and places the so-named ship-worm under the head of the latter. The Pholas or Pidack is used largely for fishing purposes on the Devonshire coast in the Old Country. The habit they possess of burrowing in stone and timber, as well as the phosphorescent light at an early period attracted the attention of conchologists. The shell is thin, and is said to be brittle. This may account for the provision made by nature to prevent extinction. In the early part of the century there was no little disputation regarding the means employed by the Mollusc to

penetrate into the place of habitation, some supposing a secreted acid was used for the purpose. A French naturalist at last solved the difficulty by proving the valves were adequate to pierce limestone, and a Brighton gentleman (Robertson) explained, from actual observations, how the common Pidack penetrated chalk rocks. Species are found fossilized in "the Lias," and also the Teredo, both in America and Europe, but neither rewarded the writer's researches during a rather hurried examination at Bath of the rocks in question many years ago. Little reliance may be placed on assertions of ordinary newspapers in matters relating to natural history, but we would feel inclined to believe there may be some truth in a statement to the effect that the Teredo had been discovered in Tertiary deposits in Europe also. There appears nothing extraordinary in this. The Pholas has been found embedded in amber, a production of that period.

THE SOLENIDÆ.

The Razor fishes, of world-wide distribution, gaping at both ends, likewise possess the property of concealing themselves, burrowing in sand, at or close to low water mark, nearly perpendicularly, and leaving a peculiar opening which reveals their position to people, who do not hesitate to fetch them to the surface by means of a stout piece of bent wire. By many they are looked upon as a great delicacy, the late Professor Forbes pronounced them to be excellent when cooked. It is fossilized in the Eocene "*Cutellus* (*Cerati Solen*) *legumen*." A British species bears a near resemblance to "Orthodesma" paralellum, (Hall), so that Woodward considered the latter probably was a Cambro-Sil. Razor fish. An internal cast (both valves) obtained some years ago from the Slabtown gravel pit, led one to imagine the shell to be more nearly allied to the "*Modiola*" (Horse Mussel) —*Lamark*.

THE MYACIDÆ.

This group also has a habit of burrowing; one of the family (Myaarenarie), Woodward remarks, is found a foot deep in its faorite haunt, viz.: the mouths of rivers on the British

coast, together with "Myatruncata." The two species I saw in Anticosti, possess precisely the same habit. I regret I did not bring back with me a few of the living shells, but I secured a great number in a fossilized state from the blue "Leda Clay" of the island, and they agree exactly with the European shells. They first put in an appearance in the "Miocene," but the Corbula (basket shell) occurs as far down as the Mesozoic age. The writer received from the Smithsonian Institute a few years ago, the fossilized specimen of a *Panopea*, a Mya now in one of the small cases. The "*Panopea Australis*" at the Cape, buried in the sand at low water to a depth of several feet. "*Saxicava*" is found to be very destructive to the Plymouth breakwater. An English naturalist states: "It has been honeycombed by the Mollusc six or more inches deep." I obtained no living ones, I think, at Anticosti, but several in the Leda Clay. They range, Woodward says, from low water to 140 fathoms, and he adds, the British specimens (Panopea) have been caught accidentally by deep water fishing hooks. In Mrs. Carey's collection you may notice some fine specimens of the Cardiadæ, from the Californian coast. The Cockle of the Old Country "*Cardium Edule*," frequents sandy beaches. Numbers of women in Ireland are employed in collecting the heart-shell for market. It was, I believe, instrumental in saving many lives during the famine in the island along the sea-coast. Like the Razor shell when it burrows in the beach, it leaves a mark which betrays its habitation. This species has been found in the "Norwich Crag." Sub-genera have been recognized as far down as the upper Silurian age, and not long since, the writer sent to the survey office, Ottawa, a Conocardium from the Ontario Devonian Rocks, which bore a near resemblance to C. Alifoyme, (Sowerly), of the mountain limestone in the south of Ireland. The "*Aviculidæ*" or Wing-shells, to which the well-known pearl oysters belong, have attracted much attention from a very early age, (the so-called *Hammer Head Oyster* is also a member of this family). Ceylon and the Red Sea were formerly famous for their valuable pearl fisheries, but long since, travellers pointed out that unless steps were taken to preserve the Molluscs, the supply must assuredly

fail in a very few years, and this prediction has since been accomplished. Since the decline, fresh diving grounds have been discovered in North Australia and the Philippines. It is said an English company, of which Mr. Streeter, of London, is a member, employs quite a number of vessels in the business, and the mother-of-pearl shells are of more value than the gems they contain. A United States daily, the *St. Louis Democrat*, mention the company, in one year of the Australian fishery, netted (at $100.00 a ton) $400,000 for the former, and the value of the latter was estimated at about a third of this amount. Perhaps these figures are unreliable, and the syndicate may not care to publish the true state of its affairs. The pearls of the "*Sulus*" are said to be remarkable for their beautiful iridescence.

THE PINNA.

This thin wedge-shaped shell is remarkable for the beautiful silken bysus by which it attaches itself to the sea-bottom rocks, etc. While Woodward places it with the above family group, Ward holds it entitled to family distinction as Pinnidæ, stating, "Unlike the *Aviculidæ*, the species of this genus have been steadily increasing in numbers since Geological times." We may think this circumstance insufficient for the change, however. The silken byssus is made into gloves, and used for various ornamental purposes by the natives of Italy and the countries to the north of the Mediterranean sea. The Aviculidæ are well represented from the lower Silurians upwards. The range is world-wide, and several are found fossilized in this neighborhood in good preservation. Among them we enumerate "Ambonychias," "Posidonomyas," "Posidonia." We have reason to believe the Pectens, or Scallops, which made their appearance in a more recent time, derived their descent from the Aviculidæ. McCoy named a Conchifer from the Carboniferous which bore as close a resemblance to the one as to the other *Aviculopecten*, and I have found Conrad in New York State calls a specimen he discovered there "Avicula pecteniformis," which amounts to "like a Pecten." The Scallop fishery of Ireland is of considerable importance. They are said

to move rapidly through the water by opening and shutting the valves, and have been known to spring sometimes a foot above water.

THE MUSSEL.

This Mollusc also moors itself by means of a byssus, like the Pinna. In the Old Country large quantities, it is stated, are consumed, especially in Scotland, in addition to the many thousands used in the fisheries. The type is not the dark blue species, the one we find at both sides of the Atlantic—*Mytilus edulis*—but the bright green one of its genus named by Chemnitz *Mytilus Samaragdinus* of the Indian seas. The Mussels at Anticosti are exceedingly numerous and unusually large. This no doubt, is owing to the fishermen not using them as bait or for other purposes. The writer brought merely a few of the living ones, but the specimens fossilized in the Leda Clay sent to the Redpath Museum, were rightly considered identical with the European species by Sir W. Dawson. We are unable to offer any satistactory explanation regarding the change in the color of *Mytilus Edulis* from deep blue to mauve. Occasionally perhaps, it occurs only in dead shells and not in living ones.

The writer never noticed it in the latter, either in the Old Country or at Anticosti. Among the fine collection presented by Mrs. Beasley to the Museum, you may notice an example The change of color is not referred to as far as I know in any Conchological work, and the generally accepted view regarding Mollusc coloring, viz., decomposition of light, etc., can hardly be quite satisfactory, since recent expeditions revealed such unexpected results as deep sea dredging brought to light. However, the matter seems more in the line of the chemist than Conchologist or Palæontologist. The *Modiola* or Horse Mussel differs from *Mytilus* in being inflated anteriorly. Woodward states it is distinguished also by its habit of burrowing or spining a nest. I have frequently found the latter in rock cavities at Anticosti. It may be when young it drifted into a hole left by some other stone borer, but another member of the family, a sub-genera, *Lithodomas*, the *Date Shell* of South Europe, cer-

tainly by some means or other manages to burrow into limestone.

THE TELLINIDAÆ.

The rich delicate coloring of this family of compressed shells has frequently called forth expressions of admiration. Among the best known on this continent is the Florida *Tellium Radiata*, the sun shell of the dealers, which we find represented in every collection we examine from the south. The Tellens have a very extensive range and bury themselves beneath the sandy bottom. It is said some members of the family have a partiality for estuaries, the mouths of rivers, etc. We may well believe this to be the case. When quartered with the Depot of the Bedfordshires (16th Foot) at Yonghal, County Cork, I was assured some handsome Tellens seen there came from the mouth of the Blackwater. The valves perhaps were not so highly colored as tropical ones, yet they were exceedingly rich. There can scarcely be a sufficient reason assigned for separating the wedge shells from the foregoing. Ward ranks the Donacinæ as a sub-family. Donax (Hecuba) Scortum, Ceylon, has not such a deep, well-pronounced color as others of the family the writer has seen. Fossil Tellens are found in Mesozoic rocks.

THE VENERIDÆ.

The type of this family was named *Venus Puerpura* by Linnæus, and came from the Philippines. The *Venus Mercenaria* of this continent produced the highly valued purple Wampum sometimes found here in Indian ossuaries and is erroneously called the *Clam* in Ontario. The *Venus* (*Cytherea*) *dione* West Indies is remarkable for the long spines proceeding from the posterior portion of the shell. The beautiful *Venus lamellosa* (*Lamark*) Australia, is not represented in our collection. These Molluscs have greatly increased since their appearance in the Mesozoic Age and attained their greatest development in this.

THE ARCADÆ.

These angular typical shells cannot well be mistaken by anyone who carefully examines the hinge line and notices

the numerous teeth, especially in old individuals ; yet the writer has known instances where orbicular forms, *Cuculæa Pectunculus* for example, were actually mistaken for a species of *Cardium*. The hinge lines widely differ as anyone may see. Upwards of 200 species in a fossilized state occur from the Silurian to recent times.

MALACOLOGY.

(Continued April 27, 1900.)

BY COL. C. C. GRANT.

TRIGONIDÆ.

The sole survivors of this ancient family are found in Australian waters. Some naturalists hold there are three distinct species dredged there, while others consider these are merely varieties, since the internal color of the shell (purple or golden) is hardly sufficient for such a distinction. Recent dredging proves a considerable difference may exist not previously suspected. Take for instance the *Cyprœa Tigris* of Linnæus—a naturalist in the United States—obtained off the Japanese coast lately no less than fifteen tiger cowries with well-marked color varieties. They vary, he states, from very light cream body color, sparsely blotched with brownish black spots, to others which are clouded with velvety brown, like precious tortoise shell. Mere varieties are probably often mistaken for that ill-defined term "species," referred to in a paper by Mr. Moffat, which has already appeared in our proceedings.

The modern Trigonia appears to be an exceedingly active mollusc. Mr. Stutchbury mentions he placed one on the gunwale of his boat, which leaped overboard, clearing a ledge four inches high. Woodward states fossil specimens are found ranging from the Trias to the chalk, and are not discovered in Tertiary rock. Perhaps this may be owing to the imperfection of the record. He refers to Lyrodesma, of the Cambro-Silurian drift of our lake shore, Amphidesma and others, and concludes their generic character has yet to be discovered, and the epidermal layer of the recent shell, with its nucleated cells, is a beautiful object under the microscope.

THE UNIONIDÆ.

The river Mussels, or *Naids*, are found in all parts of the globe, but nowhere in such abundance as in North America. Owing to the absence of dredging here in bay and lake, we are almost unacquainted with the Fauna of Ontario waters. Messrs. Hanham and Leslie, members of our association, when residing in this city obtained some *Unios* and *Anodontas* which were cast ashore by storms or caught up by ice shoves, but such were not fair representatives of the *Naids* of this locality.

Recently Mr. Schuler, a member of our association, scooped up from his boat (passing over shallow mud-banks) several large *Unios*, which appear to differ from all the writer has seen here previously. These specimens are submitted for your inspection and comparison with a few received from the Smithsonian Institute, Washington, U. S. A. It does not appear to be generally known in Ontario that the famous British pearls were by no means an unimportant factor in inducing the Roman invasion of Great Britain. These highly prized gems were obtained from river Mussels, chiefly inhabiting mountain streams. It is said the Scotch pearl fishery continued until the close of the last century. The Irish one at an earlier period was of considerable importance, and in a paper received from Ireland, mention was made of a very large fine pearl recently discovered in a river Mussel in, I think, a Donegal stream.

It is reasonable to believe that many of the rocky streams of the Dominion must also hold large quantities of pearl-bearing Mussels. When quartered formerly in London, C. W., I noticed on a low bank near a ford on the Thames River quite a number of Unios which were brought there apparently by some animal from thence, and on removing a portion of a decayed Mollusc from one valve I noticed a small pink pearl corresponding in color with the interior of the many empty heavy shells around. Old thickened specimens furnish the gems in Europe, and are just as likely to furnish these on this continent. It may be unnecessary to state the *Anodonta* (commonly called Swan Mussels), while resembling the foregoing, are edentulous ; and

a French naturalist (D'Orbigny) asserts he found the young of a species in the River Parana, singular to relate, attached by a byssus—a circumstance which can hardly have escaped the attention of evolutionists to-day.

Unios occur in Mesozoic rocks, as stated by Woodward.

THE CHAMIDÆ.

These Molluscs are better calculated to attract the Conchologist by their singularity than beauty. The uneven surface ridged and furnished with rows of spiney lamellæ is merely one of their peculiarities. Inhabiting tropical seas and found on coral reefs, it attaches itself by *either* valve. Woodward asserts if by the right, the dentition is reversed, the left having the single tooth. Independent of the general appearance the structure of the shell, consisting of three layers, is noticeable. The fossil *Diceras*, a sub-genera of the Chamidæ, has been found in the middle Oolite.

TRIDACNIDÆ—*(Clam Shells).*

These deeply ribbed, equi-valve and ponderous shells seem to have put in an appearance quite recently, fossil species occurring in the Tertiaries of Egypt. The animal is attached by a "byssus" or "free," and when the weight and thickness of the shell are taken into consideration one finds it difficult to understand the necessity of its being furnished with the means of fixing itself by the byssus to reefs at all. The Tridacna Squamosa (the type of the family) is said to be sometimes *a yard and a half long*—perhaps the "Tridacna Gigas" was meant the "Hippopus Maculatus" or Bears-paw Clam—differs from the former in shape. This may be found almost in every collection. Various stages of growth may be noticed in Mrs. Carey's case. The "Tridacna Gigas," unrepresented there, is rather expen-

NOTE.—Fossil Unios have been found in Irish fresh water Devonian the equivalents of Hugh Millar's old red sandstone. Prof. Forbes named one found in Kilkenny, *Anodonta Jukesii*. Woodward was unaware of this discovery, for he credits the Weald with the oldest fossil Unio. The late acting Palæontologist of the Irish survey, Prof. W. H. Bailey, F.L.S., F.C.S., forwarded the figure of the shell now submitted for your examination.

sive, the dealer's price averaging from $15 to $20, according to size, state of preservation, etc. So many men are now engaged in dredging that it may be reductions have been made recently which are unknown to me.

THE MACTRIDÆ.

The writer retains a clear recollection of the olden kneading trough used in the country districts in Ireland formerly (and it may be still) for the purpose of making the home-made bread for the family. The Lutraria, or otter shell of Lamark, so closely resembled it in shape, that one need not feel surprised that it may have suggested the name it bears. I think I am acquainted with only two members of the family, *Mactra Stultorum* and *Lutraria Oblonga*, both inhabitants of British waters, neither of which I recognize in the Museum collection here. Another specimen of shell found on the coast of New Orleans, named *Gnathodon Cuneatuse* by Gray, with a shell of considerable thickness for the size represented, I have not seen; perhaps they are not by any means an attractive class, and, although there are sixty or more species widely distributed—but a majority in the tropics—the dealers seldom have many for sale. They bury themselves a little below the surface in sand or mud. Lyell mentions a curious fact regarding the Gnathodon, viz:—The road from New Orleans to Point Chartrain, (six miles), is made of these shells, procured from the east-side of the lake where there is a mound of them a mile long, fifteen feet high, twenty to sixty feet wide, and in places about twenty feet above the lake level; banks of dead shells are found twenty miles inland. Mobile is built on one of these shell banks. A species has been found in the Miocene of the States, and thirty species of Mactia are known to occur in Mesozoic rocks, (Lias) and upwards. The marking called the pallial impression of a shell represents where the border of the mantle was situated, and when a sinus or bay is noticeable it proved the animal (Mollusc) possessed retractile syphons. A close relationship may be noticed in families now separated by Conchologists or dealers, by comparing the internal markings of various groups. The

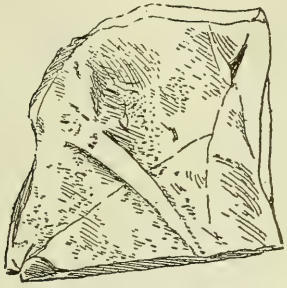
evolution of the fossil, *American Brachiopoda*, has been already clearly and most convincingly shown by Dr. Beecher, Professor Schuchert, and others. We may expect the evolution of the Conchifers to naturally follow. The tendancy at present is to form new genera or species from what may prove to be mere varieties. You will find the pallial impression in the right valve of the Conchifer.

ANATINIDÆ.

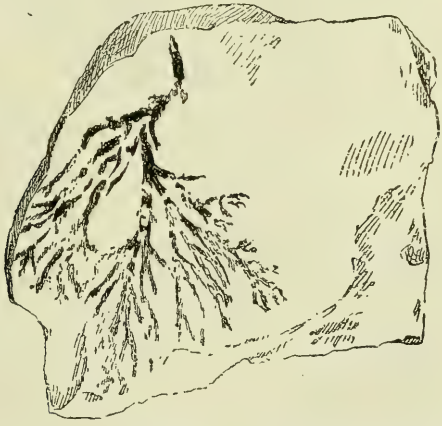
The Anatina of Lamark, sometimes called the "Duck" or "Lantern Shell," has the muscular impression faint, thin, usually in equi-valve, possessing little beauty. It, or rather the sub-genera, has some interest in the eyes of the Palæontologist, since several fossil forms have been—rightly or wrongly—classed under the head from the Palæozoic (Devonian) upwards. It has been noticed while in the living Anatina the ligament is external, cartilage internal. In *Pholadomya*, etc., we have the external ligament only. This objection may be of little importance. It was supposed that one member of the family was a boring Mollusc (Thracia pubescens, Britain), but a closer investigation proved it only occupied the burrows made by others, or perhaps when young was accidentally conveyed into empty burrows of Saxicava. I already mentioned at Anticosti "Mytilus Edulis may be noticed (small specimens chiefly) concealed in similar crevices of limestone rocks.

In the foregoing the writer may have referred to a few shells not found in our collection here, and trusts he has not omitted any important family.

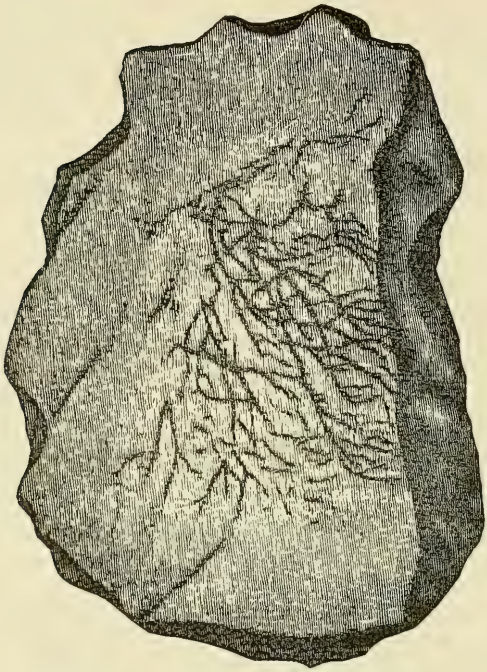
SOME RECENT LOCAL FOSSILS.



No. 1 represents a cornulites of the glaceated chert beds. It differs from "Coleolus Herzeri," the tube is slightly bent—the faint concentric lines are absent, and the surface quite plain.



No. 2 displays a beautiful Acanthograptus—single stalk, and differs from all others seen by the writer. It occurs in a glaceated upper chert bed, "Acanthograptus Bartonensis" would not be an inappropriate name if recognized as a new species.



No. 3 represents probably a new species of "Dendrograptus" from the Niagara beds, Hamilton. In the absence of the angular cell denticles of the group it is impossible to be positive on this point. It appears to proceed from a single stalk noticed in base of another specimen.

As the proceedings are not solely devoted to geological matters, a description would not be recognized. It is simply figured to attract the attention of members and others interested in Palæontology to a fine specimen lately obtained from local rocks.

C. C. GRANT.

A CURIOUS RELIC.

Somewhere in the sixties, before and immediately after the town of Hamilton took rank as a city, much laying out of streets, excavating and building took place, several very important archaeological spoils in consequence fell to the cities of Ottawa and Toronto. Fortunately all this has not been swallowed up in Provincial or Dominion museums. Thirty years ago, while men were digging a wall on south Wellington street premises, they found a "pit," not the usual " bone pit," but two sculptured bas relief heads of Niagara sandstone, one that of a woman, the other that of a man. The former is still to be seen embowered from the vulgar gaze in a quaint garden of fruit and flowers on the corner of Main street and Ferguson ave. Col. Grant, geologist, pronounces the stone to be Niagara sandstone, but does not believe the sculpture to be Iroquois but Mexican. Mr. Alison, of Waterdown, thinks the object the work of some more ancient people than the Iroquois—the Neutrals —as he has in his unique collection found about Medad many polished specimens of Niagara stone. It shows that the Neu-

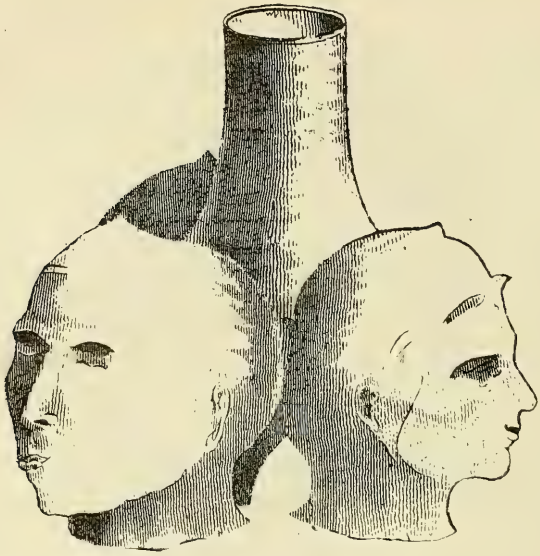


FIG. 1.

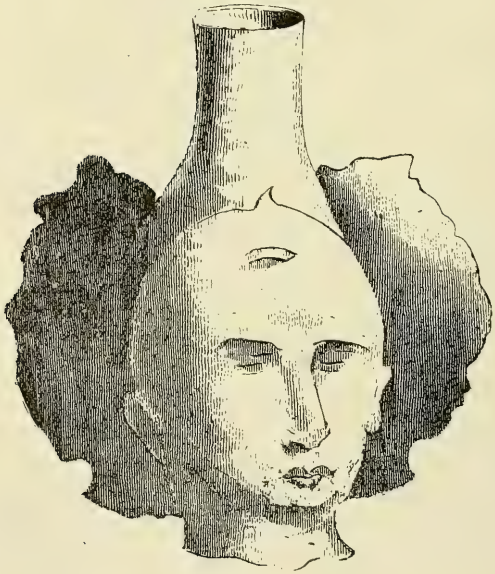


FIG. 2.

trals must have possessed some means of cutting and polishing stone in a superior manner to that of the later tribes. When these heads were discovered a number of tomahawks and axes were buried with them. It is said that these relics of a by-gone age were buried by the Iroquois. A curious opening is cut out on the back of the stone head, oblong, evidently as a hook to fasten the stone on a pole or beam.

Many of the archaeological relics found in American and Canadian museums relate back to a race of men and an age which have passed beyond the ken of modern Indian traditions. In support of Mr. Alison's theory is a remarkable representation of human heads, (Figs. 1 and 2), carved on a funeral base, called the *triune* cup, found in 1819 on a fork of the Cumberland River, Western N. Y. The object is thus described : "It consists of three heads joined together "at the back part, near the top, by a stem or handle, which rises "above the head about three inches. This stem is hollow, six "inches in circumference at the top, increasing in size as it descends." . . . .

Are these relics, found so far apart from one another, relics of the same age? Let some antiquarian answer.

J. ROSS HOLDEN.

DONATIONS TO THE HAMILTON ASSOCIATION MUSEUM, SESSION OF 1899 TO 1900.

A Fenian's bayonet and belt, picked up after the engagement at Ridgeway.

An old wooden plough of 1812, made by an early settler in the Township of Ancaster.

A pair of steel candle snuffers about the same age.

A portion of the Judge Logie's botanical collection.

A curious relic of an old cannon ball from a quarry on a farm south of the Hamilton Asylum, and probably used with many others, as in several quarries of the United States :

"The method pursued with the cannon balls is to start the block of stone away by a light blast, and then between the quarry face and the block several of the smaller solid shot, usually the four inch sort, are dropped down into the aperture. Two men with crowbars give the block a little shake, and the instant the block moves in the slightest manner forward the shot take up their 'purchase' on the space made, when the large cannon balls, some measuring 14 or 15 inches and weighing 200 or 300 pounds, are dropped into the top of the gap. Now, the slightest outward jar by levers on the big stone send these heavy cannon balls dropping downward of their own weight, until, with an easy forward motion, the cube goes over on its face.

"These shot do away with any driving ; of necessity their great weight in proportion to their size forces them downward, and their form prevents any chance of backward setting of the block.

"These cannon balls are also used as rollers, as they take up and go over the inequalities of the quarry surface, and can be rolled in any direction without resetting, thus doing away with the old style wooden rollers.

"They are also used to smother heavy clearing out blasts. Heavy rope mats are thrown over the surface where the blast has been set,

and the cannon balls are thrown on the mats."—Boston Daily Globe.

Several specimens of cut nickel ore from the copper mines in the Sudbury district. One piece taken from a shaft 1,400 feet below the surface. This piece is of great value.

A collection of fresh water shells from the lakes and rivers of Canada.

A number of specimens of carborundum :

About eight or nine years ago a then unknown man sat pondering the possibilities of discovering or producing some substance more efficient than either emery or corundum for grinding wheels and for polishing purposes. He pondered to some purpose ; then turned to experiment. An iron bowl lined with carbon, filled with a mixture of coke and clay, was connected with a dynamo. The current was turned on. Intense heat with a violent chemical action resulted. When cool once more the little mass of what had been clay and coke was broken open and a very few hard crystals of a bright blue color were seen. It was the birth of *carborundum*, a mineral probably as much harder than emery as emery itself is harder than chalk.

Encouraged by the presence of the few crystals the man renewed the experimnt on a larger scale with equal success and a daily product of not less than a quarter of a pound of carborundum. The precious stuff when ground to a fine powder was greedily bought by lapidaries at $10 per pound. Even at this famine price it was more economical, as well as more efficient than emery ; just two drams—one-eighth of an ounce—being found sufficient for a day's use in valve grinding.

The size of furnaces for producing carborundum steadily grew till now at Niagara Falls, N. Y., each of ten furnaces can produce two tons per day. This establishment, although already found too small for the demand, is of immense proportions, and is managed—with the aid of a staff of experts—by the inventor, the man who pondered and acted, E. G. Acheson, a name become famous the world over.

Carborundum, as it comes from the furnace, is a brilliant and beautiful object, a glittering mass of pinnacles clustered together and variegated in hue. Purple, garnet, sapphire, ultramarine blue,

pea and bronze green are prominent in the tints; yet the commercial value of carborundum does not lie in its beauty, but, as we have hinted, in its wonderful hardness.

The museum has been kept open every Saturday afternoon as heretofore.

ALEX. GAVILLER,
Curator.

CAMERA SECTION

OF THE

HAMILTON ASSOCIATION.

Secretary's Report for the Season ending April, 1900.

HAMILTON, April 9th, 1900.

During the season the Section has had twenty regular meetings, with an average attendance of twelve.

At the beginning of the season it was decided by the Section not to join the American Lantern Slide Exchange, and that the efforts of the members be directed towards furthering the interests of the Canadian Exchange, and also in giving demonstrations for the benefit of the younger members.

Your Secretary, as directed, wrote all the Camera Clubs in the Dominion asking for their co-operation in the Canadian Lantern Slide Exchange. Two cities signified their approval of the scheme, namely, Galt and St. Thomas. Halifax and St. John Clubs were found to be defunct, while the Toronto and Ottawa Clubs did not have the common courtesy to make any reply. Under these circumstances the whole seheme had to be abandoned.

Several successful outings were held during the summer months, which were largely attended, and some very good work performed.

At the opening meeting of the Hamilton Association an exhibition of members work was held. Mr. A. H. Baker presented a medal for the best collection of photos, which was won by A. D. Souter. F. O. Eager was second and J. R. Heddle third. The Judges, Messrs. A. M. Cunningham and J. Gordon, made special reference to some of the work of other members, and stated that the exhibition on the whole was very creditable, and the tendency was along the right lines, viz., suppression of distracting detail for a broader aspect of Nature.

The enlarging lantern in the Dark Room has been refitted, and a new reflector added which reduces the time of exposure considerably, but a new lens should be procured for this instrument as soon as possible, the lens now in use being unsuitable for enlarging owing to its lack of sharpness.

Mr. Hugh Baker gave the members an exhibition of moving pictures at his residence, which was greatly appreciated by those who were present.

During the year the Section has been instrumental in having several additions made to the Photo Literature in the Public Library. A great deal might still be added with advantage to the members, and I hope to see this considerably augmented in the near future.

Mr. S. J. Ireland gave a lecture on Composition, which was probably the most instructive demonstration of the season. It is to be regretted that so few of the members attended to hear it. To every member who aspires to become a picture maker and not merely a maker of photos, this lecture was of incalculable value—for without a grasp of some of the rules of Composition it is only by the greatest fluke that a good picture can be made. If we had more lectures of this class the general quality of our work would increase considerably.

The Roll of Membership was revised and 26 name deleted, the membership at present being 65. I would like to note here that out of this membership only one-sixth attend our meetings. There must be a cause for this poor attendance, and the removal of this cause ought to be one of the first things attended to by the new Executive. This subject was brought up by some of the younger members, was discussed and finally laid on the shelf. It must not be allowed to lie there, or the very life of the Section will be endangered.

Some means whereby better accommodation, facilities for work, and social intercourse can be procured, is essential for the advancement of the Section, and the officers for the ensuing year will have to make this paramount over everything else.

The members have done better work this season than ever before. Three of our members having taken first prizes in outside competition.

Regarding the future work of the Club, I would like to throw out a suggestion. The Club has now on its hands a very large collection of slides, most of which are uninteresting owing to there being nothing to sustain the interest during the exhibition of any of the sets. If the Club would choose some poem, song or short story, let each member do his best to illustriate it, at the end of the season a committee might be appointed to select from the work done the best photos illustrative of the poem or song, from which a set of slides of lasting interest might be made. I believe that something along this line would tend to hold the interest of the members, cultivate the imagination, test the artistic capabilities and draw out the best talent in the Section. No doubt we would make many failures in working out such a scheme, but let us use them in true Tennysonian fashion, and " Rise on our dead selves to higher things."

In conclusion I would beg to thank the members for the honor which they conferred upon me in electing me Secretary of the Club, and to apologise for any shortcomings I may have been guilty of.

Respectfully submitted,

J. R. HEDDLE,
Secretary.

TREASURER'S STATEMENT TO MAY, 1900.

RECEIPTS.

Cash balance, 1899	$147 85
Government grant	400 00
Members subscriptions	114 00
Hamilton Horticultural Society, rent	3 50
Wentworth Historical Society, rent	6 00
	$671 35

DISBURSEMENTS.

Rent of museum	$138 00
Rent of dark room room photo section	12 00
Caretaker	44 50
Gas accounts	12 68
Printing	21 05
Journal of Proceedings	175 00
Postage and stationery	28 44
Grant to photo section	5 13
Sundry accounts	21 25
Balance on hand	213 30
	$671 35

P. L. SCRIVEN, *Treasurer.*

REPORT OF THE CORRESPONDING SECRETARY FOR THE SESSION OF 1899-1900.

To the Officers and Members of the Hamilton Association:

Your Corresponding Secretary for the year 1899-1900 begs leave to report that:

1. He has carried on the ordinary correspondence of the Association.

2. He has received and acknowledged the exchanges in accordance with the subjoined list of institutions and societies, and these various bodies have also been furnished with copies of our last annual "Journal and Proceedings."

THOMAS S. MORRIS.

LIST OF EXCHANGES.

I.—AMERICA.

(1) Canada.

Astronomical and Physical Society.....Toronto.
Canadian Institute.....Toronto.
Natural History Society of Toronto.....Toronto.
Department of Agriculture .....Toronto.
Library of the University.....Toronto.
Public Library .....Toronto.
Geological Survey of Canada .....Ottawa.
Ottawa Field Naturalists' Club.. .....Ottawa.
Ottawa Literary and Scientific Society.....Ottawa.
Royal Society of Canada..... .....Ottawa.
Department of Agriculture .....Ottawa.
Entomological Society.....London.
Kentville Naturalists' Club .....Kentville, N. S.
Murchison Scientific Society .....Belleville.
Natural History Society.....Montreal.
Library of McGill University ... .Montreal.
Nova Scotia Institute of Natural Science.....Halifax.
Literary and Historical Society of Quebec .....Quebec.
L'Institut Canadien de Quebec .....Quebec.
Natural History Society of New Brunswick.....St. John.
Manitoba Historical and Scientific Society .....Winnipeg.
Guelph Scientific Association .....Guelph.
Queen's University .....Kingston.
Niagara Historical Society .....Niagara.

(2) United States.

Kansas Academy of Science.....Topeka, Kan.
Kansas University Quarterly.....Lawrence, Kan.
American Academy of Arts and Sciences.....Boston, Mass.
Psyche .....Cambridge, Mass.
Library of Oberlin College .....Oberlin, Ohio.

American Association for Advancement of Science ..... Salem, Mass.
Museum of Comparative Zoology ..... Cambridge, Mass.
American Dialect Society ..... Cambridge, Mass.
United States Department of Agriculture ..... Washington, D. C.
Biological Society of Washington ..... Washington, D. C.
Philosophical Society of Washington ..... Washington, D. C.
Smithsonian Institution ..... Washington, D. C.
United States Geological Survey ..... Washington, D. C.
American Society of Microscopists ..... Buffalo, N. Y.
Buffalo Society of Natural Sciences ..... Buffalo, N. Y.
California Academy of Sciences ..... San Francisco, Cal.
California State Geological Society ..... San Francisco, Cal.
Santa Barbara Society of Natural History ..... San Francisco, Cal.
University of California ..... Berkley, Cal.
Minnesota Academy of Natural Sciences ..... Minneapolis, Minn.
Academy Natural Sciences ..... Philadelphia, Pa.
Academy of Sciences ..... St. Louis, Mo.
Missouri Botanical Gardens ..... St. Louis, Mo.
American Chemical Society ..... New York City.
New York Microscopical Society ..... New York City.
The Linnean Society ..... New York City.
American Astronomical Society ..... New York City.
American Geographical Society ..... New York City.
New York Academy of Science ..... New York City.
Terry Botanical Club ..... New York City.
Central Park Menagerie ..... New York City.
American Museum of Natural History ..... New York City.
Scientific Alliance ..... New York City.
Cornell Natural History Society ..... Ithaca, N. Y.
Johns Hopkins University ..... Baltimore, Md.
Kansas City Scientist ..... Kansas City, Mo.
Wisconsin Academy of Science, Arts and Letters ..... Madison, Wis.
Society of Alaskan Natural History and Ethnology ..... Sitka, Alaska.
University of Penn ..... Philadelphia, Pa.
Franklin Institute ..... Philadelphia, Pa.

War Department ..... Washington.
Field Columbian Museum ..... Chicago.
Academy of Sciences ..... Chicago.
Agricultural College ..... Lansing, Mich.
Colorado Scientific Society ..... Denver, Col.
Museum of Natural History ..... Albany, N. Y.
State Geologist ..... Albany, N. Y.
Rochester Academy of Sciences ..... Indianapolis, Ind.
Indiana Academy of Sciences ..... Indianapolis, Ind.
Davenport Academy of Natural Sciences ..... Davenport, Iowa.
Pasadena Academy of Sciences ..... Pasadena, Cal.

(3) West Indies.

Institute of Jamaica ..... Kingston, Jamaica.

(4) South America.

The Royal Agricultural and Commercial Society of British Guiana ..... Georgetown.

II —EUROPE.

(1) Great Britain and Ireland.

England.

British Naturalists' Club ..... Bristol.
Literary and Philosophical Society of Leeds .... Leeds.
Conchological Society ..... Leeds.
Royal Society ..... London.
Royal Colonial Institute ..... London.
Society of Science, Literature and Art ..... London.
Geological Society ..... London.
Manchester Geological Society ..... Manchester.
Mining Association and Institute of Cornwall .. Camborne.
Cardiff Photographic Society ..... Cardiff.
Owens College, Conchological Society ..... Manchester.

Scotland.

Glasgow Geographical Society ..... Glasgow.
Philosophical Society ..... Glasgow.

Ireland.

Royal Irish Academy.....Dublin.
Royal Geological Society of Ireland.....Dublin.
Naturalists' Field Club.....Belfast.

(2) Austria-Hungary.

Anthropologische Gesellschaft.....Vienna.
K. K. Geologische Reichsanstalt.....Vienna.
Trentschin Scientific Society.....Trentschin.

(3) Belgium.

Societe Geologique de Belgique.....Liege.

(4) Denmark.

Societe Royal des Antiquaires du Nord.....Copenhagen.

(5) France.

Academie Nationale des Sciences. Belles Lettres et Arts.....Bordeaux.
Academie Nationale des Sciences, Arts et Belles Lettres.....Caen.
Academie des Nationale Science, Art et Belles Lettres.....Dijon.
Societe Geologique du Nord.....Lille.
Societe Geologique du France.....Paris.

(6) Germany.

Naturwissenschaftlicher Verein.....Bremen.
Naturwissenschaftlicher Verein.....Carlsruhe.

(7) Russia.

Comite Geologique.....St. Petersburg.
Russich-Kaiserliche Mineralogische Gesellschaft.....St. Petersburg.

III.—ASIA.

(1) India.

Asiatic Societies of Bombay and Ceylon.
Asiatic Society of Bengal ..... Calcutta.
Geological Survey of India ..... Calcutta.

(2) Straits Settlements.

The Straits Branch of the Royal Asiatic Society. Singapore.

(3) Japan.

Asiatic Society of Japan ..... Tokyo.

IV.—AFRICA.

(1) Cape Colony.

South African Philosophical Society ..... Capetown.

V.—AUSTRALIA.

(1) Australia.

The Australian Museum ..... Sydney.
Royal Society of New South Wales ..... Sydney.
Linnean Society of New South Wales ..... Sydney.
Australian Natural History Museum ..... Melbourne.
Public Library of Victoria ..... Melbourne.
Royal Society of Queensland ..... Brisbane.
Queensland Museum ..... Brisbane.

(2) New Zealand.

New Zealand Institute ..... Wellington.

(3) Tasmania.

Royal Society of Tasmania ..... Hobartown.

LIST OF MEMBERS

OF THE HAMILTON ASSOCIATION.

HONORARY.

1881 Grant, Lt.-Col. C. C., Hamilton.
1882 Macoun, John, H A.,Ottawa.
1885 Fleming. Sanford, C. E., C. M. G., Ottawa.
1885 Farmer, William, C. E, New York.
1885 Small, H. B,. Ottawa.
1887 Charlton, Mrs. B. E., Hamilton.
1887 Dee, Robert. M. D.. New York.
1887 Keefer, Thomas C., C. E., Ottawa.
1890 Burgess, T. J. W., M. D, F. R. S. C. Montreal.
1891 Moffat, J. Alston, London.
1898 Carry, Mrs. S. E, Hamilton.
1899 Stratton, A. W., Ph. D., Lahoore, India.

CORRESPONDING.

1871 Seath, John, M. A., Toronto.
1881 Clark, Chas K., M. D., Kingston.
1881 Spencer, J. W., B. Sc., Ph. D, F. G. S., Savannah, Ga.
1882 Lawson, A. C., M. A, California.
1884 Bull, Rev. Geo. A., M. A., Niagara Falls South.
1885 Frood, T., Sudbury.
1889 Yates, Wm, Hatchley.
1889 Kennedy, Wm., Austin, Tex.
1891 Hanham, A. W., Quebec.
1891 Woolverton, L., M. A., Grimsby.

LIFE.

1885 Proudfoot, Hon. Wm., B. C., Toronto.

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Ballard, John F.
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Beasley, Mrs. Thos.
Beckett, H.
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Birrell, Wm.
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Campbell, Robt.
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Fearman, R. C.
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Gaviller, Alex.
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Graham, C. O.
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Grant, A. R,
Greene, Joseph
Grossman, Julius
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Lees, Geo.
Lees, W. A.
Leaney, C. A.
Leggat, Matthew

Linger, Jesse
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Logan, W. McG., M. A.
Lottridge, Murray.
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Magee, Frank.
Mills, Edwin
Millard, J. W.
Mitchell, W. M.
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Moodie, J. R.
Moodie, Jas.
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Mullin, Arch.
Mulvaney, W.
McIlwraith, Thos.
McInnes, Hon. Donald.
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McKenzie, A M.
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Neill, A. T.
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Patterson, P.
Powis, A.
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Wilson, T.
Wilson, Wm.
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Witton, H. B., Jr., B. A.
Witton, W.
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JOURNAL AND PROCEEDINGS

OF THE

...Hamilton...

Scientific Association

SESSION 1900-1901.

NUMBER XVII.

CONTENTS.

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1894	S. Briggs.....	A. T. Neill.....	T. W. Reynolds, M.D...
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Geo. Dickson, M. A.	Geo. Dickson, M A.	Richard Bull.....	T. McIlwraith..
Geo. Dickson, M. A.	Geo. Dickson, M. A.	A. Macallum, M. A.	T. McIlwraith..
R. B. Hare, Ph. B...	Geo. Dickson, M A.	Richard Bull.....	A. T. Freed.....
Geo. Dickson, M. A.	A. Robinson, M. D..	Richard Bull.....	W. H. Ballard, M.A.
Geo. Dickson, M. A.	Wm. Kennedy.....	Richard Bull.....	W. H. Ballard, M.A.
Geo. Dickson, M. A.	Wm. Kennedy.....	Richard Bull.....	W. H. Ballard, M.A.
Geo. Dickson, M. A.	A. Alexander.....	Richard Bull.....	Wm. Turnbull..
Geo. Dickson, M. A	A. Alexander.....	Richard Bull.....	A. Gaviller.....
Geo. Dickson, M. A.	A. Alexander, F.S.Sc	Richard Bull.....	A. Gaviller.....
H. B. Witton, B. A..	A. Alexander, F.S.Sc	Richard Bull.....	A. Gaviller.....
H. B. Witton, B. A..	A. Alexander, F.S.Sc	Richard Bull.....	A. Gaviller.....
H. B. Witton, B. A..	A. Alexander, F.S.Sc	Richard Bull...	A. Gaviller.....
H. B. Witton, B. A..	A. Alexander, F.S.Sc	Richard Bull	A. Gaviller.....
Thos. S. Morris.....	A. W. Stratton, B.A.	Richard Bull.....	A. Gaviller and G. M. Leslie..
Thos. S. Morris.....	C. R. McCullough...	Richard Bull.....	A. Gaviller and G. M. Leslie..
W. McG. Logan, B.A.	S. A. Morgan, B.A..	Thos. S. Morris.....	A. Gaviller and W. Chapman..
W. McG. Logan, B.A.	S. A. Morgan, B.A..	Thos. S. Morris.....	A. Gaviller and W. Chapman..
Rev. J.H. Long, M.A. LL. D.	S. A. Morgan, B.A..	J. M. Burns.....	A. Gaviller and W. Chapman..
Rev. J.H. Long, M.A. LL. D.	S. A. Morgan, B.A., B. Pæd	P. L. Scriven.....	A. Gaviller and H. S. Moore..
Wm. C. Herriman, M. D.	S. A. Morgan, B.A., B. Pæd.	P. L. Scriven.....	A. Gaviller and H. S. Moore..
Thos. S. Morris.....	S. A. Morgan, B.A., B. Pæd.	P. L. Scriven.	A. Gaviller.....
Thos. S. Morris.....	S. A. Morgan, B.A., D. Pæd.	P. L. Scriven.....	A. Gaviller and J. Schuler....
Thos. S. Morris.....	G. L. Johnston, B.A.	P. L. Scriven.....	A. Gaviller and J. Schuler.....

MEMBERS OF COUNCIL.

1857—Judge Logie ; Geo. L. Reid, C. E.; A. Baird, C. Freeland.

1858—Judge Logie ; C. Freeland ; Rev. W. Inglis, D.D.; Adam Brown ; C. Robb.

1859—Rev. D. Inglis, D.D.; Adam Brown ; Judge Logie; C. Freeland ; Richard Bull.

1860—J. B. Hurlburt, M.A., LL.D.; C. Freeland; Judge Logie ; Richard Bull ; Wm. Boultbee ; Dr. Laing.

1871—Geo. Lowe Reid, C.E.; Rev. W. P. Wright, M.A.; A. Macallum, M.A.; A. Strange, M.D.; Rev. A. B. Simpson.

1872—Judge Proudfoot ; Rev. W. P. Wright, M.A.; John Seath, M.A.; H. D. Cameron ; A. T. Freed.

1873—Judge Logie ; T. McIlwraith ; Rev. W. P. Wright, M.A.; A. Alexander ; I. B. McQuesten, M.A.

1874—Judge Logie; T. McIlwraith ; Rev. W. P. Wright, M.A.; A. Alexander ; I. B. McQuesten, M.A.

1875—Judge Logie ; T. McIlwraith ; Rev. W. P. Wright, M.A.; A. Alexander ; I. B. McQuesten, M.A.

1880—M. Leggat; I. B. McQuesten, M.A.; A. Alexander; Rev. A. Burns, M.A., LL.D., D.D.

1881—T. McIlwraith ; H. B. Witton ; A. T. Freed; Rev. W. P. Wright, M.A ; A. F. Forbes.

1882—T. McIlwraith ; H. B. Witton ; A. T. Freed ; A. F. Forbes ; Rev. C. H. Mockridge, M.A., D.D.

1883—A. Alexander ; A. Gaviller ; A. F. Forbes ; T. McIlwraith ; R. Hinchcliffe.

1884—A. Gaviller ; A. F. Forbes ; T. McIlwraith ; R. Hinchcliffe ; W. A. Robinson.

1885—W. A. Robinson ; S. Briggs ; G. M. Barton ; J. Alstan Moffat ; A. F. Forbes.

1886—J. Alston Moffat ; Samuel Slater ; Wm. Milne ; James Leslie, M.D.; C. S. Chittenden.

1887—J. Alston Moffat; James Leslie, M.D.; P.L. Scriven; Wm. Milne ; C. S. Chittenden.

1888—J. Alston Moffat; B. E. Charlton; T. W. Reynolds, M.D.; S. J. Ireland ; Wm. Kennedy.

1889—T. W. Reynolds, M.D.; S. J. Ireland ; William Turnbull ; A. W. Hanham ; Lieut.-Col. Grant.

1890—Col. Grant ; A. W. Hanham ; W. A. Robinson ; A. E. Walker ; Thomas S. Morris.

1891—Col. Grant ; W. A. Robinson ; J. F. McLaughlin, B.A.; T. W. Reynolds, M.D.; Wm. Turnbull.

1892—T. W. Reynolds, M.D.; W. A. Robinson ; P. L. Scriven ; Wm. Turnbull ; Wm. White.

1893—James Ferres ; A. E. Walker ; P. L. Scriven ; Wm. White ; W. H. Elliott, Ph.B.

1894—James Ferres; A. E. Walker; P. L. Scriven ; J. H. Long, M.A., LL.B.; W. H. Elliott, B.A., Ph.B.

1895—J. E. P. Aldous, B.A.. Thomas S. Morris ; W. H. Elliott, B.A., Ph.B.; P. L. Scriven ; Major McLaren.

1896—J. E. P. Aldous, B.A.; Thomas S. Morris ; W. H. Elliott, B.A., Ph.B.; George Black ; J. M. Burns.

1897—W. H. Elliott, B.A.; Thomas S. Morris ; Robert Campbell ; J. R. Moodie ; Wm. White.

1898—W. H. Elliott, B.A.; Robt. Campbell ; W. A. Childs, M.A.; Wm. C. Herriman, M.D.; W. A. Robinson.

1899—W. H. Elliott, B.A.; Robt. Campbell ; W. A. Childs, M.A.; Wm. C. Herriman, M.D.; W. A. Robinson.

1900—Robt. Campbell ; W. A. Childs, M.A.; George Black ; J. F. Ballard ; J. H. Long, M.A., LL.B.

ABSTRACT OF MINUTES

OF THE PROCEEDINGS OF

The Hamilton Association

DURING THE

SESSION OF 1900-1901.

THURSDAY, NOVEMBER 1st, 1900.

OPENING MEETING.

The President-elect, S. A. Morgan, B. A., D. Pæd., was introduced by the Past President, Dr. Thos. W. Reynolds, and delivered his inaugural address. In it he first referred to the progress made during the present age, in the various departments of science and art, and afterwards discussed in a philosophic manner the relation of Evolution to Idealism.

At the conclusion of the President's address prizes were presented to the winners in a photographic competition held by the Camera Section.

The meeting then enjoyed the pleasure of examining the beautiful display of pictures which the Camera Section had arranged for the occasion.

THURSDAY, DECEMBER 7th, 1900.

The President, Dr. Morgan, in the chair.

The minutes of the previous meeting were read and confirmed. After the business was disposed of, the Hon. Thos. Bain was introduced and read a paper on "The Duties

of Speaker of the House of Commons." The composition of the House was first described, then the opening and prorogation ceremonies, the use of the Mace, etc. Frequent reference was made to the usages of the British House of Commons.

Mr. Witton opened the discussion of the paper by adding many interesting reminiscences of his early parliamentary career. After several other members had taken part, a hearty vote of thanks was passed to Mr. Bain for his admirable paper.

THURSDAY, JANUARY 10th, 1901.

With the President, Dr. Morgan, in the chair, the minutes of the last meeting were read and confirmed.

Mr. J. H. Smith, I. P. S., then gave a paper on "Place Names in Wentworth," in which he traced the origin of a large number of county names and related many amusing incidents connected therewith. Mr. Smith promised to provide his paper for publication in the Journal. The meeting adjourned at 9.30 P. M.

THURSDAY, JANUARY 21st, 1901.

With Dr. Morgan, the President, in the chair, a special meeting was held, at which Prof. Abbott of Toronto University delivered a most interesting lecture on "Light and Color." The lecture was illustrated by a large number of experiments, and the subject was discussed largely from a psychological standpoint. The lecturer brought forward numerous problems, which our present knowledge did not enable us to explain. This is especially true if the subject is studied from a materialistic point of view. He was ably assisted in the conduct of the experiments by Mr. Anderson, lecturer in physics.

A hearty vote of thanks, on motion of Dr. Reynolds, was passed to the lecturer.

The Camera Section then took charge of the meeting and exhibited a large number of Toronto and Montreal slides, after which the meeting adjourned.

THURSDAY, FEBRUARY 14th, 1901.

With the President, Dr. Morgan, in the chair, the regular meeting of the Association was held this evening.

The minutes of the last regular and of the subsequent special meeting were read and confirmed.

Fifteen applications for membership were received, and on motion of Mr. Alexander seconded by Dr. Reynolds. election was proceeded with at once. The ballot proving favorable, they were declared duly elected.

The President then introduced Rev. Dr. Lucas, who gave a paper on "Great Events in Astronomy." The lecturer traced the evolution of this great science from its infancy to the present time. He gave a most interesting historical review of the subject.

A hearty vote of thanks was passed to the Doctor for his paper.

Expression was then given in fitting terms, by the President, of the deep sense of loss felt by the members in the death of our late beloved Queen, who had always been a patron of science and art.

The meeting then adjourned.

THURSDAY, FEBRUARY 28th, 1901.

The President, Dr. Morgan, being in the chair, a special meeting was held at which Prof. E. C. Jeffrey of Toronto University delivered a most instructive lecture on "The Life and Character of Plants."

By means of a series of micro-photographic slides which were thrown on the screen by Messrs. Heddle and Souter, every part of the subject was fully illustrated. The internal mechanism of leaves, stems and roots was explained. The ways in which plants adapt themselves to special environments, such as the sandy desert, the salt seashore, the heat of a

tropical mid-day, or long periods of drought, were clearly set forth. The operations of parasites were also dwelt upon.

At the conclusion a hearty vote of thanks was passed to the Professor.

The meeting adjourned at 9.30 P. M.

THURSDAY, MARCH 21st, 1901,

Dr. S. A. Morgan, President, was in the chair.

The Association's recent loss by the death of Dr. Macdonald and B. E. Charlton, Past Presidents, was brought before the attention of the members by H. B. Witton, a Past President, who referred to them as two of the most estimable members of the organization. He said there should be a record on the minutes of the profound grief and heartfelt sorrow of the members at their passing away, and the record should express appreciation of the services of the doctor and Mr. Charlton to the society, also sympathy for the bereaved friends. Mr. Witton paid an eloquent tribute to the worth of the two departed members, and his feelings almost overcame him while speaking. He linked their names with those of Judge Logie, Prof. Wright, and other deceased members of the Association whose connection with it had been of great benefit.

Mr. Witton moved the following resolution, seconded by George Black: That the Hamilton Association deplores the loss sustained in the death of Dr. J. D. Macdonald and B. E. Charlton, and gratefully records its appreciation of their tireless efforts to promote the principles of the Hamilton Scientific Association, and the officers and members desire the Secretary to respectfully tender the bereaved families their profound sympathy.

Dr. Morgan, in a few words, supplemented the remarks of Mr. Witton on the loss to the society, and the resolution was carried.

Prof. Squair, of Toronto University, then delivered a lecture on "Church Architecture in Northern France." It was illustrated, and was not only interesting but it was highly educational. The lantern was manipulated by Wm. White and J. R. Heddle.

The Professor, who said architecture was one of the greatest of human arts, pointed out the relation existing between changes in architecture and changes in thought and sentiment. Architecture, particularly of the church kind, was stated to be the richest legacy that the mediæval times had left to modern art. Church architecture of northern France was of three periods, mediæval, classical and modern. In the mediæval period the architecture was Romanesque and Gothic, in the second period was classical and in the third the renaissance.

He then pointed out the connection between architecture and thought, beginning at the first of the twelfth century with his pictures of the churches. In the early days the ground plan of the churches was always in the form of a cross, this and many other architectural features showing the impress made by Christian ideas upon the art of the time. Some excellent views of Notre Dame, Paris, were shown, as well as many other interesting pictures.

The lecturer was given a hearty vote of thanks.

THURSDAY, APRIL 25th, 1901.

With the President, Dr. Morgan, in the chair, Prof. Fletcher of the Central Experimental Farm, Ottawa, was appointed as representative of the Association at the coming meeting of the Royal Society in Ottawa.

Natural History notes from Mr. Wm. Yates, of Hatchley, were then read by Dr. Reynolds and A. Alexander. In his customary pleasing and instructive way Mr. Yates wrote on the seasons, the crops and various things that harrass the

farmer, noting peculiarities in each of these lines. He also wrote of the habits of the crane, hawk and bittern.

The reference to birds and their nests prompted A. Gaviller, the Society's Curator, to express his indignation at the acts of some boys who recently, during a visit to the museum, broke a number of valuable eggs. He also complained of several Journals being missing.

FRIDAY, MAY 3rd, 1901.

At a special meeting held in Dr. Cummings' office, the doctor gave an illustrated lecture on the subject of the X rays. These were discovered by Roentgen in 1895, and are produced by means of an electric current in specially constructed bulbs, which are exhausted of air to a high degree. The current used by the doctor came direct from the Cataract Power Company at DeCew Falls, and consisted of a voltage of 104 and 15 amperes. A current of high potential is needed for the production of the rays. The manner in which the low potential of the commercial current may be converted into the high was described.

The Crooke's tubes which are used consist of hollow glass globes which are emptied of air. In those emptied to a thousandth part the current produced a purple colored light. In others which contained only about a millionth part of air the light produced was of a beautiful apple green color. This is the X ray, and is produced in the tube of high vacuum.

The doctor next showed that the X rays are invisible by using a tube covered with black velvet. The apple green color could not be seen at all as before, yet the rays passed through the cover and penetrated a sheet of cardboard and a sheet of aluminum held before them. A piece of lead was then shown to be opaque to the rays, as also a glass bulb, because it contained lead in its manufacture.

Several members then held their hands before the screen. The bones were distinctly visible, with the flesh as a light

border. Some of the thinner members then stood before the rays, and on the screen could be distinctly traced the position ot the heart and ribs ; even the beating of the heart and the movement of the diaphram were visible to the experienced eye. A watch in the pocket of one gentleman was also shown. Then a purse was used, and the coins in it were visible.

One feature of the rays is, that they cannot be refracted, and so may not be used in ordinary photography. Photographs are taken by throwing the rays direct upon the plate without the interception of lenses. The doctor then took a photograph of a deformed hand. It was exposed to the rays for about the space of one minute, and when developed showed the hand most distinctly. He developed also at the same time a photograph of a young man who had swallowed a ten cent piece. The coin could be seen located in the neck. Another interesting photograph showed the effect of an electric current on a photographic plate. It might be described as a picture of lightning, and showed a remarkable likeness to plant growth. A practical illustration was also given of the use of the flouroscope, by means of which any object may be examined directly when the rays are turned upon it.

As to the nature of the X rays, the doctor said that Roentgen himself called them the unknown rays, and thought they must consist of particles of the electric fluid cast off into the air. The French describe them as "black light," and say they are beyond the range of the solar spectrum.

The lecturer then referred to their many uses in medical surgery. In the recent South African war, the doctors were able to locate the bullets and extract them at once. One case was mentioned where the bullet entered the neck and was discovered in the ankle. In this connection it was mentioned that President Garfield's life might certainly have been saved had the use of the X rays been known at the time.

Fractures and dislocations can be located at once, and examined. A living illustration of this process was afforded

by a boy who was brought in, having fallen and injured his elbow joint. A photograph was taken, and the bone was found to be fractured near the elbow.

In answer to a question as to the use of the rays in strictly medical work, the doctor stated that consumption can be seen in the chest long before it can be detected by the ordinary symptoms. Pleurisy and pneumonia can also be detected. The size and condition of the heart can be accurately estimated, etc.

At the close of the lecture the members adjourned to the parlors, where they were entertained by the Misses Cummings, while the doctor attended to the boy's injured limb.

A hearty vote of thanks, moved by A. Alexander, and seconded by S. C. Briggs, was then passed to Dr. Cummings for the rare treat he had given the Association, and to the Misses Cummings for their hospitality.

THURSDAY, MAY 9th, 1901.

The regular meeting of the Association was held this evening with the President, Dr. Morgan, in the chair.

After the disposal of sundry matters of business, Dr. Baugh read a paper on "The Relation of Matter to Spirit." This valuable paper will be found printed in full in these Proceedings. It was considered so important that it was decided to devote a separate evening to its discussion.

The annual meeting was then held, when reports were presented and adopted as follows:

Report of the Council, by the Secretary.
" " Curator, by Alex Gaviller.
" " Geological Section, by A. T. Neill.
" " Biological Section, by A. Alexander.
" " Photographic Section, by D. Souter.
" " Corresponding Secretary, by Thos. S. Morris
" " Treasurer, by P. L. Scriven.
" " Auditors, by F. Hansel and H. S. Moore.

The election of officers resulted as follows:

President . . . . . S. A. Morgan, B.A., D. Pæd.
1st Vice-President . . . J. M. Dickson, Esq.
2nd " . . . Robert Campbell, Esq.
Corresponding Secretary F. F. Macpherson, B. A.
Recording Secretary . . G. L. Johnston, B. A.
Treasurer . . . . . P. L. Scriven, Esq.
Librarian and Curator . Alex. Gaviller, Esq.
Assistant Librarian . . J. Schuler, Esq.
Auditors . . . . . H.S. Moore and F. Hansel, D.D.S.
Council—Messrs. W. A. Childs, M. A., Geo. Black, J. F. Ballard, J. H. Long, M. A., LL.B., and J. R. Heddle.

REPORT OF COUNCIL.

Your Council take pleasure in submitting their report for the session 1900-1901.

The session now closed has been a most encouraging one for the Association. The papers contributed have been mostly of a very superior character and of deep scientific interest. During the period referred to, there have been held four meetings of the Council and nine of the general Association, at which the following papers were read and discussed :

1900

Nov. 1st—"Inaugural Address"—President S. A. Morgan, B. A., D. Pæd.

Dec. 6th—"Duties of the Speaker of the House of Commons" —Hon. Thos. Bain.

1901

Jan. 10th—"Place Names in Wentworth"—J. H. Smith, I. P. S.

Jan. 21st—"Light and Color"—Prof. Abbott.

Feb. 14th—"Great Events in Astronomy"—Rev. Dr. Lucas.

Feb. 28th—"Life and Character of Plants"—Prof. Jeffrey.

March 21st—"Church Architecture in Northern France"—Prof. Squair.

April 25th—"Natural History Notes"—Wm. Yates, Esq.

May 3rd—"X Rays"—Dr. Cummings.

May 9th—"The Relation of Matter to Spirit"—Dr. Baugh.

Prof. Fletcher, of the Central Experimental Farm, Ottawa, was appointed to represent this Association at the coming meeting of the Royal Society.

Your Council are pleased to place on record the valuable assistance given to the general meetings of the Association by the Camera Section, not only in the beautiful display of

pictures made at the opening meeting for the year, but also for the operation of the lantern by members of that section for several illustrated lectures.

During the year the Dundurn Museum has been opened and Mrs. Carry's collection of shells has been removed by her, from our Museum, to that place. At the request of the Chairman of the Parks Board we have loaned the cases for the same.

During the year we have been called upon to mourn the loss by death of two Past Presidents of this Association, Mr. B. E. Charlton and Dr. Macdonald, obituary notices of whom will be found in these proceedings.

Your Council would express the hope that during the coming recess the members will be gathering materials and making preparation for the work of the coming year, so that the standard reached during the past year may be not only maintained but surpassed in the future.

All of which is respectfully submitted.

S. A. Morgan,
President.

G. L. Johnston,
Secretary.

INAUGURAL ADDRESS.

Read November 1st, 1900.

BY S. A. MORGAN, D. PÆD. PRESIDENT.

LADIES AND GENTLEMEN:

In assuming the Presidential chair of your Association,—a chair adorned by so many worthy and distinguished occupants in the past—it will be but proper that I give expression to my appreciation of the high honor you have thus conferred upon me. I cannot, however, be insensible of my own unworthiness to rank as the first of your twentieth century presidents, and am fully conscious, moreover, that in extending me this honor you have not sought out one whose capacities fitted him for these high duties, but have desired rather to recognize my years of service (and, I trust, of faithful service) in the lower offices. Whatever value these services may have been to the Association, I can assure you they have been to me but as a labor of love, and that the same effort for the welfare of the Association shall mark my labors in the higher office.

Before proceeding to the subject to which I would especially draw your attention this evening, let us briefly survey the present outlook of the scientific and sociologic world. The gigantic strides with which physical science has, during the latter half of the closing century, been working out the problem of man's mastery of his physical environment, give no signs of decline on this its entrance into a new century. Since the close of our last session marked advance has been made in the problem of electric transmission which gives promise that distance will shortly become a vanishing factor in the problem of force transmission.

In the social world we are still confronted with the galling friction between labor and capital; and it must be

evident to every thoughtful student that in this question the coming century is to receive its most trying legacy. When we consider that in a city so prosperous even as our own there will scarcely be found, perchance, one citizen in ten who is wholly free from the heart-wasting effort of supporting a dollar civilization on a ninety cent income, is it not time for civilization herself to ask why such a burden exists?

While recognizing the presence of the evil, we are not of those, however, who despair of the social future. If (as we believe to be the case) the social fabric is a vital organism in which individuality is to secure its perfection, then surely this organism will possess the power of purging from itself these poisonous excretions. Nor is there any good reason, perhaps, to consider the present inequality between the rights of labor and capital as more than temporary. It must be evident to all that through the introduction of labor saving machinery there has resulted not only a great disturbance for labor itself, but that capital has likewise been exalted into a temporary master. The centralizing of industry and the lengthening of the process of production, (both incident upon machinery) have called for a larger relative use of capital and have thus emphasized its present importance.

While taking this hopeful outlook for the future, it nevertheless behooves society to be on the alert. We must not forget that there was a time when society was told that the noble and the serf were essential to its vital existence. Our own nation has taught the old world how little truth was contained in this easy maxim. Is it beyond hope that we may yet show the world that golden chains are not essential to a free manhood?

Turning briefly to the political world, we are here struck with the phenomenal growth of the imperialistic idea within our own empire and people. Our fathers freely sacrificed their blood to build up a firm and enduring nation. It is becoming apparent that no less zeal will be displayed by their children in an effort to render these blessings cosmopolitan. May we prove equal to the labor that this high task must involve!

Time demands, however, that we should now call your attention to what we have selected as the subject proper of our evening's remarks. It has been truly said that the present phase of scientific research is markedly eclectic. The student of to-day finds that truth will usually be found on both sides of our great scientific and philosophic controversies—that no great doctrine is likely to be universally false or universally true. Knowing this, the eclectic philosopher does not set himself in violent opposition with the claims of opposing sects, but rather examines all in order to find some rational ground for the reconciliation of their opposing claims. It is with this spirit that I would ask you for a few moments to consider with me the subject of Evolution and Idealism.

On the onset permit me to state that I do not purpose to enter into any controversy concerning the general facts of evolution. As a student of mental philosophy, I must accept the general facts which the evolutionary biologist postulates as essential to the rational explanation of the facts and principles of his own science. Accepting these, however, I still claim the right to investigate whether the theory will in itself furnish an adequate explanation of the nature and origin of life—and more particularly of self-conscious life. Let us begin with a brief statement of what may be considered the leading principles of evolution, as furnished by the biologist himself.

Beginning with the individual, the biologist finds that individual man passes in embryo through certain stages which may actually be found to exist in the animal series. Again in psychic or mental development, he finds the infant to begin, in prenatal experience, with certain impulses and sensations which proceed through perception, memory, imagination and volition into self-conscious and spiritual freedom. From this the biologist sees by analogy, an explanation for the origin of the organic and spiritual man out of the lower types. If the individual, so the race may be supposed to have had a similar series in its organic and conscious development.

Accepting the principle as laid down, and granting that organisms do not spring into existence without antecedent

causes, but rather proceed from the unceasing development of a single principle, we are yet at liberty to ask the evolutionist why and by what processes these lower forms develop into higher. In answer to this question, the biologist will postulate two great principles which are supposed to underlie all development—those of habit and adaptation.

In the law of habit, the evolutionist postulates that an organism possesses a tendency to continue with increasing ease and readiness processes and movements beneficial to itself. The features of habit, therefore are these—the organism receiving a stimulation from without tends to respond thereto. In this response there moreover arises a certain attitude or readiness for a similar stimulation. The law of habit, however, cannot in itself account for organic development, since its application would necessarily tend to fixity and a beating of time on the part of the organism. Hence habit is complemented by another principle known as the law of adaptation or accommodation.

The law of adaptation affirms that the organism while taking its habitual attitude towards repeating stimuli also possesses the power of adapting itself to the varying conditions of these stimuli. Thus, while the organism becomes habituated to its environment, in so far as that environment is a changing one, habit itself will be modified by the law of accommodation. Thus there will necessarily arise a constant action and reaction between habit and accommodation, through the application of which organic development may be effected.

Thus far the claims of evolution seem in no way inconsistent with the facts of development and growth as observed in the phenomena of biology. All organisms are found to take this two-fold aspect toward stimulations—while they are attracted toward some they recede from others. Granting all this, however, there remains another question to be answered. Granting that the creature answers to its stimulations in such a way as to increase its vitality, the question remains to be answered, "Why does the individual respond in such a way as to produce such a result?" To answer this evolution postulates a new

law—that of selection—which affirms that the organism tends to select and habituate itself to such stimulations as increase its vitality. If, however, the organism possesses, as it undoubtedly does, this selecting power, by which it is able to respond to those stimulations which make for its vital development, and to avoid those which make for its destruction—then this selective function is likewise to be accounted for.

The current explanation for this principle may be stated somewhat as follows : The creature is suppose to be endowed with certain spontaneous movements—which in some way bring it into relation with its varying stimulations. Certain of these give stimulations resulting in pleasure while others result in pain, these results lingering with the organism in a form of memory. Here, however, it will be seen that an unaccountable factor has been introduced. How is this original spontaneous movement to be accounted for? To this question, I believe, evolution can furnish no adequate answer. We have seen, moreover, that in accounting for the selective principle it is found that these chance movements result in pleasure or pain to the organism.

Coming to the principle of pleasure and pain, the following questions present themselves : Why does the organism select the one and reject the other? Why are these stimuli pleasurable and those painful? Why do the pleasurable stimuli result in the increased vitality of the organism? To these questions HEREDITY can give no adequate answer, since we must assume for the organism a starting point outside of heredity. Evolution at this point then must end its search in the origin of life with the bare statement of the presence of a tendency on the part of the individual to select pleasurable stimuli, which in turn are found to result in the increased vitality of the organism. Such a selection, however, postulates an ability on the part of the organism to retain and develop its vital expression, and starts, therefore, with a tendency to secure a beneficial and a developing experience. Thus it must become evident that the criterion of choice at the base of the selective process signifies a prior inherent

endowment within the individual—a tendency to secure such a vital and beneficial experience or realization. Evolution as seen in the progress of the individual thus becomes an expression of the modifications incident on the growth of this beneficial and developing experience. From this it must become evident that the facts of evolution are to be viewed as a resultant manifestation rather than as a primary cause.

If, moreover, all individual development starts with such a tendency for a beneficial experience, then the organic world must constitute a rational system, in other words, the individual must represent a particular manifestation in a single purposive universe. If, again, the individual secures his development through being an individual expression in such a rational universe, then it becomes evident that this selective tendency, with which we have seen that all organic development must begin, is but the habit of the universal in its particular manifestations. Thus evolution is thrown into the arms of idealism for a philosophic explanation of its phenomena. Let us examine this, however, more closely.

To account for the selective principle through which the facts of evolution find a scientific explanation the biologist must postulate the presence of a universal tendency inherent in the organism toward a beneficial realization of the individual. Since, however, the individual secures this beneficial realization in virtue of its contact with and relations to other individual manifestations, it follows that the individual constitutes an expression within an organic universe. From this again we infer that the universe itself must represent an organism developing toward a rational end in its several individual manifestations. Thus the particular manifestation is found to constitute the expression of the spiritual ideal of a rational universal.

While depending, however, on idealism for its philosophic interpretation, evolution, on the other hand, repays its debt to idealism. In unfolding the principles of organic development it has unfolded the aspects and conditions under which the universal manifests itself in the particular. In this way

it has taught the idealist philosopher that nature is not to be torn apart into two opposing worlds of existence, that matter and mind cannot be totally divorced, but that in all her manifestations she is rather to be viewed as both subjective and objective. For, granting with the idealist, that self-consciousness must stand as the highest manifestation of existence, the evolutionist has nevertheless taught us that self-consciousness itself cannot be wholly independent of matter. To enter into a close examination of the parallels which appear between consciousness and organic movement would carry us beyond the limits of our subject, a few of the more evident facts, however, may be noted. If we examine into the connection which is found to exist between conscious life and the movements of the nervous system, here we find not only that the fulness of the phenomena of consciousness is co-ordinate with the complexity of the nervous organism, but that in man mental development is dependent on the development of the cerebrum. In like manner the researches of physiologist and pathologist have shown the closest relation to exist between cerebral action and modes of consciousness. Thus the evolutionary biologist has turned idealism from the barren task of explaining reality solely from the standpoint of the spiritual. If such be true it becomes evident that neither evolution nor idealism can in themselves furnish us with an explanation of the nature and process of reality, which rather must be sought through a co-ordinating of their labors and products.

In conclusion permit me to prophesy that even in such a co-ordination the problem of existence will not unfold itself. If, as we have contended, in the manifestations of reality subjective and objective cannot be divided into a two-fold world of experience, but the principles of each are present in and essential to all her processes, then the physicist must likewise make his contribution to the solution of this problem. When the best fruits of the labors of these three shall have been presented at one common altar, let us hope that a new revelation shall illumine this ever-interrogating problem as to the origin and end of reality.

THE SPEAKER AND THE HOUSE OF COMMONS.

Read before the Hamilton Scientific Association.

BY HON. THOS. BAIN.

Parliament, as constituted in the Dominion of Canada, consists of three branches: 1st, the Queen, as represented by His Excellency, the Governor General; 2nd, the Senate, 81 members, appointed by the Crown for life; 3rd, the House of Commons, at present 213 members, viz: 65, always a fixed number, from the Province of Quebec, 92 from Ontario and 56 divided among the other provinces and territories, and the assent of each of these three branches is required before any act can become law. 15 Senators constitute a quorum and in the Commons 20 with the Speaker.

The Canadian Parliament first assembled in the present buildings at Ottawa on the 8th of June, 1866, and the British North American Act of 1867 creating the Dominion, made that city the political Capital, The site of the parliament buildings is one of great beauty, on a cliff rising high over the Ottawa river and overlooking the broad valley with the Laurentian hills of Quebec in the blue distance, and the falls in sight, rendered famous by the account of travellers since the days of Champlain. The buildings are in the Gothic style and in the opinion of connoisseurs entitled to rank with the best architecture of Europe. Externally they are picturesque. For internal convenience and practical utility, one feels disposed to endorse the opinion of Mr. McKenzie, that they were splendidly adapted for a monastery rather than for a Legislative Assembly. Here, however, once each year meet the Senate and Commons of Canada.

The opening of Parliament is always a great event for Ottawa, a perennial source of excitement to her citizens, and

an attraction sufficient to draw crowds of visitors from all parts of the country. The official ceremonies are announced to take place in the Senate at three o'clock, but long before that hour the ample grounds are filled with an expectant crowd while inside the corridors leading to the galleries of the Senate chamber are crowded with ticket holders waiting for weary hours for the doors to open so that they may secure a good place to view the ceremonies. In 1879, long before noon, the doors of the Senate galleries were besieged by ladies in force, all anxious for a view of the Princess Louise, then present for the first time with the Marquis of Lorne as Governor-General. The Senate chamber is a fine room of the same size and style of architecture as the Commons, but the draperies, colorings and furniture are in excellent taste, and give it an effect missed in the Commons. On this occasion it is resplendent. Ladies in full dress occupy the space usually alotted to the Senators, while they humbly occupy seats at the feet of the ladies. The Judges of the Supreme Court are present in their scarlet robes bordered with ermine, and the Cabinet Ministers attend in their gold laced uniforms, while the A. D. C's in waiting wear Her Majesty's scarlet. At last the royal salute is fired from the guns on Nepean Point and the enthusiastic cheers of the assembled crowd announce the arrival of the Governor-General who enters and taking his seat on the throne, desires the presence of his "Faithful Commons".

And what of the Commons all this time? The forenoon of the opening day is always bright and gay in the Commons Chamber. Members renew their acquaintance of past sessions amidst ceaseless handshaking and exchange of more or less spicy jokes, and if the first session after the general election, the forenoon is occupied in administering the oath of allegiance to Her Majesty at the table in the chamber in lots of four and six, followed by signing the roll, belated members afterwards going through that ceremony in the Clerk's office.

In the British House of Commons with 675 members the "swearing in" process is tedious and occupies days, and so many new members after an election are hard to identify, and

it is said doorkeepers and policemen carry books in their pockets into which they have been for weeks gathering likenesses of new members from illustrated papers pasted in to identify by. After by-elections there a new member must be introduced by two members who "stand sponser" that he is the man, and the member elect has to present to the Clerk at the table his certificate of election from the Returning Officer before he can be sworn in.

It is told that a distinguished member of the House of Lords, formerly in the Commons, found on reaching the table to take the oath that he had not the essential blue paper. He searched his pockets on the spot, and in his hurry and confusion to the no small amusement of the watching House threw out a number of letters, then a purse, next some silver and coppers, a bunch of keys, and finally a pipe, on the sacred table. But no certificate. He had to retire without taking the oath. Later, outside the bar of the House, he found the essential certificate in his hat, and returning again to the table amidst cheers and laughter got safely through his initiation. In 1874 Dr. Kenealey was elected for Stoke-upon-Trent, and owing to his conduct in the Tichborne case was unpopular and could not find two members to act as his sponsors. He advanced to the table alone carrying with him his huge umbrella which he irreverently hung by its crook on the mace, and armed with his certificate claimed the right to take the oath, but the Speaker refused to permit him without the two sponsors and he was obliged to withdraw. Later on motion of Mr. D'Israeli, who was then leader of the House, the formality was dispensed with, and he took his seat by resolution of the House, a lonely member without two friends.

Formerly this practice after by-elections did not exist with us, but since the year 1876 it has become the standing custom; but the certificate of election is sent direct by the Returning Officer and the oath is administered in the Clerk's office. In that year the member for Centre Wellington, (Dr. Orton) being unseated during recess and re-elected, returned to the House and inadvertently sat and voted during the next

session without taking the oath. No penalty was imposed, but his name was removed from the division lists in which he had voted, and this led to the adoption of the British custom. Last session the member for Labelle, Que., who resigned his seat and was re-elected during recess found himself in much the same difficulty as Dr. Kenealey, as the House did not sympathize with his views respecting sending out the South African contingent. Finally Mr. Tarte, taking pity on a brother French member, although repudiating his opinions, offered to introduce him with Mr. Monet, and Mr. Bourassa took his seat with the usual formalities.

But hark to the three knocks at the chamber door. The sergeant-at-arms with his sword goes to see what's the trouble. He returns grave and solemn to announce to the Speaker, "A messenger from the Senate is waiting at the door." With no less gravity the Speaker answers, "Admit the messenger." The messenger enters. It is the Usher of the Black Rod, the chief officer of the Senate, who comes to announce that His Excellency desires the presence of the Commons in the Senate Chamber. Before opening his mouth he advances nine steps, making three profound bows as he proceeds, announces his message first in English then in French, backs out with the same number of bows, if possible more profound, wheels and disappears invariably accompanied by a formidable clapping of hands from all parts of the chamber. The House never fails to enjoy the exercise and seems to think it is worth the money it costs. The members rush in a troop to the Senate Chamber, but not in anxiety to hear the speech from the throne. That duty pertains to the Speaker, who discharges it most religiously.

Suppose it is after the general elections and the House has no Speaker. In that case His Excellency causes it to be intimated to them "that he does not deem it advisable to make known his reasons for summoning Parliament until the Commons have elected a Speaker," which the Commons return to their Chamber and proceed to do. After the Speaker is elected and has made his acknowledgments to the House, the mace is

laid on the table, where it always remains during the sittings of the House while the Speaker is in the chair. Again summoned the following day, the Commons in much the same fashion return to the Senate Chamber, preceded by the Sergeant-at-Arms bearing the mace with the newly-elected Speaker in his robes af office, and wearing an air of gravity as he has a speech to make. Here you find the reason for applying the name "Speaker" to the presiding officer of the House of Commons. He is in fact the Speaker of those who have elected him. In their name he addresses the Sovereign thus: "May it please your Excellency:

The House of Commons have elected me their Speaker, though I am but little able to perform the important duties thus assigned to me. If in the performance of those duties I should at any time fall into error, I pray that the fault may be imputed to me, and not to the Commons whose servant I am, and who, through me, the better to enable them to discharge their duty to their queen and country, humbly claim all their undoubted rights and privileges, especially that they may have freedom of speech in their debates, access to Your Excellency's person at all reasonable times, and that their proceedings may receive from Your Excellency their most favourable interpretation."

Again, at the close of the session, before prorogation of the House and after formal assent has been given to the other bills of the session, the Speaker again addresses the representative of the sovereign in presenting the "Supply Bill," being an act to grant to Her Majesty certain sums of money to defray certain expenses of the public service during the fiscal year.

The reply is in these terms: "In Her Majesty's name His Excellency, the Governor-General, thanks her loyal subjects, accepts their benevolence and assents to this bill."

This ceremony recalls the long struggle in the early years of British history with the king to establish the principle of the people's right to govern themselves and to permit none other to tax them.

Goldwin Smith truly says: "The Imperial Government, the Queen, retains a veto on all Dominion legislation. So far as the internal legislation of Canada goes, the imperial veto, like the veto of the British sovereign in home affairs, sleeps as it has slept since the days of William III. Canada does as she likes in home affairs, marriage with a deceased wife's sister, 'an adverse tariff,' and against copyright, being the only exceptions.

From 1867 down to 1890 only 15 acts of the Dominion were reserved by the Governor-General for the assent of the the Queen, and only one disallowed, reducing the Governor-General's salary."

These old customs and antique solemnities transplanted from another world to our modern and democratic midst, open the pages of history from the day when William the Conqueror landed on the shores of England in the eleventh century down to our own day, when a royal princess, descended from the blood of William, takes her place in these same ceremonies, in the city of Ottawa, which were carried by the Conqueror from Normandy into England, and in turn from England to this continent, to find again many of the people who were detached from the land which was the cradle of William.

Mr. Speaker Gully of the British House of Cammons, re-elected for the third time on Monday last, is the fifth Speaker that has presided over that House during the reign of our Queen, is the 10th Speaker of this century, and following Sir William Hungerford, who was the first English Speaker elected in the year 1377, is the 137th in one unbroken line. His salary is £5,000 per annum, with an allowance of £100 for stationery, a residence and suite of rooms at Westminster, a secretary and staff of clerks, and as they do not change the Speaker there at every parliament, £1000 equipment money upon his election and the remains of an old custom, two hogsheads of claret.

He has also a state coach for high ceremonial occasions, said to have been made in the days of Cromwell, and weighing

over five tons. On his retirement from office he has the privilege of being called "to the House of Lords." And the peerage is accompanied by a pension of £4000 a year for life.

Since confederation in 1867 the present is the eighth Speaker of the Canadian Commons. The practice usually being a new Speaker with each new parliament, and alternately English and French, although that order was departed from in 1896, when Sir James Edgar was called to the chair.

Although the English Speaker enjoys more perquisites, and has more responsibilities, the Commons at Ottawa have provided a comfortable suite of rooms in the buildings for their Speaker, with a suitable salary attached, and it is the Speaker's own fault if his position is not reasonably pleasant, as after all there is a strong feeling of respect for any one in that position in the House who respects the right of the members.

The mace figures somewhat prominently in parliamentary government. An English authority says: "When the mace lies upon the table it is a House; when under, it is a committee. When it is out of the House, no business can be done. When from the table and upon the Sergeant's shoulder, the Speaker alone manages. Before the election of Speaker it should be under the table, and the House cannot proceed to the election of a new Speaker without the mace." When not in use in parliament it is kept safely under lock and key in the Speaker's rooms and accompanies him on all state occasions. The mace now in use at Ottawa belonged to the old Legislative Assembly of Canada, and was carried away by the rioters on the 25th of April, 1849, when the parliament buildings were burned at Montreal, when Lord Elgin was Governor-General, but was subsequently recovered.

The American mace in the House of Representatives at Washington is described as a bundle of ebony rods bound with bands of silver, bearing at the top a silver globe on which is perched the national eagle with outspread wings.

The Legislatures of Nova Scotia, New Brunswick and Prince Edward Island have never used a mace, so that after all it may not be absolutely essential.

Since the year 1877 the House of Commons has been opened each day with prayer read by the Speaker at three o'clock, before the doors are open to the public, in English or French, as may suit the Speaker. The Senate has always been opened with prayer, but they do not entrust that duty to their Speaker, having from the beginning had a paid chaplain, and the roll is called and the attendance recorded.

It is the duty of the Speaker to preside at all the sittings of the House, except when in Committee of the Whole ; to enforce its rules of order ; to announce the business of the House in the order in which it shall be taken up ; present messages and papers ; receive all proper motions and put them ; see that votes are properly taken and announce the result ; reprimand or admonish members, and under the order of the House commit persons to the custody of the sergeant-at-arms. He must even put a question when it affects him personally and decide questions of order subject to an appeal to the House; when there is a tie give the casting vote—that is of very rare occurrence. He has also general charge of the House and the staff of officers attached. Above all things to retain the respect of the House he must be fair and impartial in the discharge of the wide powers entrusted to him, and nothing contributes to the authority of the chair so much as the conviction among the members that in its occupant they have made a happy choice.

Outside of his duties in the chair the Speaker's position is useful in promoting friendly intercourse between the members on opposite sides, and official dinners and levees are recognized modes of promoting good feeling and intimacy among members. It was formerly said of Sir John A. Macdonald, when leader of the House, that for social purposes the doubtful members were marked conservative and frequently invited to dine with him. And I recall once in committee of supply, when the occupant of the chair had notoriously evaded his social duties, on an item for the Speaker's apartments, Mr. Mackenzie solemnly rose and gravely enquired, " Mr. Chairman, would it be possible to see the inside of those rooms ?" to the no small amusement of the committee who felt the application.

In the year 1888, the rules of the Imperial Parliament were modified, conferring somewhat arbitrary powers on the Speaker to close up discussion and bring the question before the House to an issue, and in Congress at Washington the powers conferred on the Speaker are somewhat drastic. It was the exercise of these powers there that secured for the late Speaker Reed the title of "Czar." Here we have adopted the early British practice and have not changed. Our Rule No. 35 provides for closing debate and precluding further amendments by the formal motion, "That this question be now put," and if resolved in the affirmative the original question is to be put forthwith without further amendment or debate. But so unwilling is the House to limit the freedom on discussion that even when the debate is palpable obstruction I can recall only about three occasions in the whole of my experience when "The Previous Question" was moved to close the debate. Mr. Speaker was created "First Commoner of the Realm" by an Act of the reign of William and Mary, and as such he has precedence of all Commoners.

Sir John Trevor was Speaker when the Act was passed conferring on him and his successors this dignity and he is notorious in Parliamentary history as being the only Speaker who was expelled from the House. A few years later he was found guilty of accepting a bribe of one thousand guineas from the city of London for his aid in passing the Orphans' Bill through the House, and on March 12th, 1695, had to read the resolution condemning him, unanimously passed by the House, which preceded his expulsion.

No Speaker of the Canadian House of Commons has ever reached that degradation, and the only member expelled was Louis Riel in 1874, during the North-west troubles when he fled from the country an outlaw.

In the British House the practice prevails of the Speaker calling the member's name who is to continue the debate, and the practice dates from Trevor's time. Formerly, as is the practice here, the Speaker looked at the member who was to continue the debate, and with a slight bow indicated that he

was to speak. But Trevor had a "squint," and often two members in different parts of the house were convinced that they had "caught the Speaker's eye." This led to confusion, and for the sake of peace and harmony it became necessary for Trevor to call the name and it has continued the practice since.

After the opening ceremonies and before the Speaker reports the speech from the throne, it is the invariable practice of the leader of the House to introduce a bill and have it read a first time. Thus the Journals of last session read: "Sir Wilfred Laurier introduced a bill No. 1 respecting administration of oaths of office, which was read a first time." For the twenty-eight years of my parliamentary life this bill has discharged this duty and is still fresh. This is done in assertion of the right of parliament to consider at once other business before discussing the matters referred to in the speech of His Excellency as representing the Queen.

The duty of moving the reply to the Speech from the Throne is usually allotted to two of the youngest members, one English speaking and one French, who, while proud of the honor, dread the ordeal of facing an assembly of old debaters, although it is the kindest audience in the world to new members on these occasions. Except when the opposition wish to delay the other business of the House it has become the practice of late years not to have much debate on the address but to pass it formally and proceed to more pressing business, although while it lasts it is lively and brings out a bright attack and reply from the leaders of the Opposition and the Government,

As you are aware, with the large French speaking population of the Province of Quebec, both the French and English languages are used in the House. All official documents are printed in both languages, and a French translator is kept constantly at the Clerk's table in the House whose duty it is to read every motion in that language to the House before it is put from the chair. Of late years the use of French in addressing the House has been steadily falling into disuse, and is now in

comparatively little use, largely for the reason that most of the French members speak English quite readily, but chiefly that in using French they speak only to a limited audience in the chamber.

But the race characteristics remain and are marked. I cannot better express these characteristics than by quoting a few lines from an address of the present leader of the House spoken a few years ago on this subject of parliamentary life : "One of the many qualities that render the English apt in parliamentary government is that they know how to listen and to be tolerant. It is not in the ardent temperament of the French to respect the convictions of others, for he conceives with so much intensity that he cannot admit the possibility of others differing from him. The Englishman has his own opinions and he is not astonished because you differ from him, in fact he would despise you if you had no opinion of your own.

"See what happens in the legislative body at Paris. There is an orator in the Tribune. His adversaries cannot keep quiet. From all points of the chamber arise interruptions and protests and at times it ends in confusion. Look on the other hand at our House of Commons. It supports the most furious attacks without wincing and no one dreams of interrupting unless the orator permits interruption. Nevertheless the attack is keen, often bitter. The orator's friends applaud, his adversaries do not budge. When they believe the attack fair they endure without wincing. If he exaggerates they emphasize by ironical applause. If he falls into misstatement the faces relax as there is nothing to fear. If he grows paradoxical he receives every latitude and they listen with amused wonderment.

"The Englishman respects your opinions but he never thinks of your feelings. For us sons of France political sentiment is a passion, while for the Englishman it is a question of business."

The House of Commons is above all a meeting of business men and business questions are there treated. Strangers

coming to the capital to hear the debates are frequently disappointed. They expect to hear great eloquence, they simply hear business discussion. Nevertheless some of these discussions are really eloquent.

But there are other aspects of parliamentary life. There are the silent members who never speak, who act on the old saying, "They are the wisest part of parliament who use the greatest silence," and who secure the approval of the leaders, especially of the party in office, and others who follow the rule never to be present at a debate or absent from a division.

One of the cruel things in the life of a member who aspires "the listening Senate to command" is that after devoting days and nights to the manufacture of antitheses, epigrams and other flowers of rhetoric for his speech in a great debate, he patiently sits night after night waiting to "catch the Speaker's eye," but fails to find the attention of that wandering orb, while he hears his arguments and illustrations used by other men who had probably gone to the same source for them, until at last the end comes suddenly, perhaps by some arrangement of the leaders, without an opportunity being afforded him of relieving his mind of the weighty unspoken speech which oppresses it. Then his constituents complain that he is a useless silent member because his name is not in the newspapers, and they are convinced he is neglecting his duty. He then feels much like the reporter who wore a tall hat as the representative of *The Irish Times* at a proclaimed meeting, *i. e.*, a forbidden political gathering. In the melee a policeman smashed his hat with a blow of his baton. "What did you do that for?" asked the reporter indignantly, "I am a member of the press." "Oh, I beg your pardon," said the constable, "I thought you were a member of parliament." He had at least the consolation of the English author who said, "I wrote books for twenty years and I was nobody, I got into parliament and before I had taken my seat I had become somebody."

There is no place in the British House of Commons for the reigning sovereign. The only king who was rash enough

to make the experiment was Charles I, in 1642, and his visit to the House ended so disastrously to him that no sovereign has since made the experiment.

It is a curious circumstance that the queen has never seen her "faithful Commons" in session although she has been on the throne for sixty years. She is denied the spectacle that may be witnessed by the humblest subject of her own sex. Her Majesty could be an unobserved spectator behind the grille of the ladies' gallery. But the fact remains that by the theory of the constitution she is prohibited from entering the House of Commons.

In 1846 the Prince Consort was in the peers' gallery of the British House of Commons to hear the opening debate on Sir Robert Peel's resolution for leave to introduce a bill to repeal the Corn Laws. A few nights later Lord George Bentick, who was bitterly opposed to the measure, accused Prince Albert of allowing himself to be present to give the semblance of Her Majesty's endorsement of the measure. Prince Albert keenly resented the idea and never again came to the gallery. So bitterly were the landed magnates opposed to the repeal of the Corn Laws that they quoted without pretext Lord Alvanly's atrocious saying, "Peel ought not to die a natural death." That was the first time a member of the Royal family had attended the debates. Now the presence of the Prince of Wales or the Duke of York in the peers' gallery is of frequent occurrence and no one dreams of suggesting any possible political influence.

In the early years of Confederation Lord Dufferin occasionally was present at an interesting debate and had a seat on the floor of the House for an hour or two, but I can recall no visit from any recent Governor-General, although the ladies of the Governor's household attend quite frequently and have always done so.

House meets at 3 o'clock, sits till 6 o'clock and usually rises, resumes at eight o'clock, and sits on an average to one o'clock in the morning.

Of late years questions bulk largely on the orders of the day, both with us and in the English Parliament. The practice is to hand them to the clerk two days in advance of the time when they are asked from the printed orders. They relate to every conceivable matter in the public service.

At times the House is not quite "all attention" when some tedious speaker has the floor, and audibly dissents. It is said in the British House Sir Spenser Compton being appealed to by a member who pleaded he had a right to be heard, "No, sir," said the Speaker, "you have a right to speak but the House have a right to judge whether they will hear you." No modern Speaker could give such a ruling. "I am speaking to posterity," said another bore in reply to his tormentors. "Faith and if you go on at this rate you will see your audience before you," came from a Milesian voice.

The House tolerates with wonderful patience all kinds of speakers although they may be unpopular, but the member who is up on his subject and can add to the information of the House on any question before it, makes his statement and then sits down is always sure of a welcome and a kindly hearing.

GREAT EVENTS OF ASTRONOMY.

Read before the Hamilton Scientific Association, February 14th, 1901.

BY D. V. LUCAS, D. D., GRIMSBY, ONT.

Among the sciences astronomy is the first in rank. It is the oldest, the most patient and persevering, and withal the most triumphant. The subject matter with which it deals towers immeasurably above and reaches far beyond that of any other with which the human mind has ever grappled. It demonstrates in a measure as no other can the greatness of the Creator, and at the same time, though not in the same degree, the greatness of man.

That a being so helpless in his infancy and with an individual life so brief and with native powers so apparently inadequate should succeed with the rolling centuries in reaching into space and discovering the proportions and distances and velocities of the orbs of heaven is something which heightens our regard for the race to which we belong.

I have not come to tell you anything new but to stir up your pure minds by way of remembrance, lest we forget what has been accomplished by those great men whose names should be honored by all generations.

Step by step, from the first going down of the sun, or the changing phases of the moon before the eyes of our amazed primeval parents to the discovery of the outermost planet in our solar system, the great science has gone on from victory to victory, dispelling darkness, superstition and error, and putting in their place intelligence, admiration and reverence. Astronomy in its earlier efforts was so simple, the unlettered shepherd on the mountain side was equal to the task of its initiation, while as it progresses it offers us heights

insurmountable and depths unfathomable. We have the best of evidence that it is a very old science. Job speaks with utmost ease and off-hand familiarity of the constellations, which, it is very clear, had been mapped out and named before his day. When once the spirit of enquiry respecting the heavens was awakened, it was never to sleep again. The individual sentinel may have been relieved that he might rest from his labors, but another took his place and the vigil was unbroken. From the hill tops of Eden and the lofty peaks of Ararat, from the watch towers of Babylon or the pyramids of Egypt, from the plains of Shinar to the deserts of Arabia, the astronomer has patiently pursued his inspiring observations, grateful for what he had received from those who had preceded him, and longing in his turn to give something more to those coming after him.

Those phenomena near at hand which necessarily involved some connection with other worlds, it is probable led the way. The tides must have been a source of wonder to the ancient observer. It took years to find that the moon had anything to do with this daily rising of the waters. The rocks and hills and plains are just as much influenced, but their tongues are tied, they cannot tell it if they would. The yielding water, like an honest ghost, blabs the secret out. *Luna amat terram*, the moon makes love to the earth, and would embrace her, hence the tides.

The moon's phases next claimed the attention of the early astronomers. What strange power was that which produced these regularly recurring changes in this sun of the night. It was easy to see that the sun and moon and some of the stars also moved, but behind all these, and deeper imbedded in space were stars which as compared with those nearer moved not. These were called "fixed stars." To detect the movement of those nearer the fixed stars became an absolute necessity. By them the motions of the planets could be traced, until astronomers even in the very early ages came to know their beaten pathway through the sky. The early observers noticed, however, that those stars which they called

"fixed stars" moved in circles, or seemed so to do, for as yet distinction had not been made between apparent and real motion. While they looked intently, however, at the northern constellations they were at length surprised to find one which absolutely did not move. Here was a great discovery. What joy it must have afforded the astronomor of those earlier days to tell his countrymen that here was a star which would be of immense service to them in their wandering over lands and seas.

The discovery of the North Polar Star was the first valuable gift of astronomical science to mankind. Long was the battle and fierce as long, before men came to know that much of the motion appearing above our heads and around us is not real. The motion that affects us most of all and is most real, we can neither hear nor feel nor see, as if our Maker intended that we should some day learn that there are realms of truth which lie beyond the ken of ordinary powers of sense appealing in vain to all except our common sense.

One of the greatest of our more modern astronomers was despised, opposed, hated, persecuted, imprisoned, before the *learned*, even the religious world would consent that such a thing could be. That it was our world that moved, and that for the greater part the circles which men thought they saw in the heavens were only imagination, and not real, being caused by their own motion about the axis and through the orbit of the earth, was one of the very great events of astronomy, bringing men much nearer to the great central orb of truth respecting the order and movements of the heavenly bodies.

The first astronomical instrument ever invented by human genius was a *gnomon*, a pole ten or twelve feet long placed perfectly upright in the middle of a level piece of ground. A shepherd reclining at noon in the shade of a rock noticed that the shadow of his shelter grew longer or shorter according to the varying season of the year. This excited his curiosity and like a true philosopher, he must know the reason why. Having prepared his ground and erected his gnomon,

he began to mark the lengthening of the shadow. Each day it advanced till at length it stopped, stood still for a few days, then began to grow shorter till six months later it stopped again, stood still for a time, then began again to lengthen. To one believing that the earth was flat and immovable, and that the sun's orbit was an exact circle, this must have been most puzzling. He began to doubt whether things were exactly as they had seemed to be. Either the sun had a zig-zag motion or the earth itself was moving. This last thought came like a flash of inspiration but was at once dismissed as he saw no way to prove so daring a speculation. If the mysteries involved in these motions could not then be solved, four fixed facts were recorded, viz., the summer and winter solstices, and the autumnal and vernal equinoxes. This was an event of no small importance, especially to the tiller of the soil, who saw here data to direct him in his sowing and his reaping. Eclipses of the sun had been witnessed by terror stricken millions. Superstition at such times reigned supreme and fiendishly laughed at the multitudes' fears. To see the sun extinguished at midday was not only an awful sight to the ignorant but in addition to the darkness just fallen on them there were ten thousand forebodings of still greater evils just at hand, conjured up in their terrified minds. There were a few thoughtful men who argued that these events were but the ordinary course of nature and that some day they would be easily explained. It was observed that an eclipse of the sun never took place when the moon was visible. Even when the sun's light was extinguished and the stars shone out during the day, the moon could nowhere be seen, yet the very next day after an eclipse of the sun, the moon in crescent form was quite near the sun. It did not then take long to discover that an eclipse of the sun was caused by the moon crossing the sun's path, in line with some portion of the earth, this led to the discovery that the moon shone only by reflecting the light of the sun. It did not take long after this event to explain the mystery of the phases of the moon.

To predict successfully an eclipse of the sun was the next

great event in the history of astronomy. These things now seem so simple to us that I fear we cannot appreciate the triumphant ecstasy of the bold prophet who first dared to fix a date for such an occurrence and witness the fulfilment of his prediction. There was in the city the busy hum of trade and pleasure and gossip. Some had heard that a madcap had said that the sun would disappear that day and none believed or heeded. Such an event had never occured in their day and there were no records in the hands of the people to show that any such thing had ever happened. The predictor watched with intense anxiety from some lofty eminence. Presently the sun grew dim and men looked up to see if clouds were gathering. In a few moments more all saw that some mighty demon was devouring the King of Day. A little later all was darkness. A wail of horror rent the air. Thousands on their knees cried for mercy. Some died from very fright. The joy of the anxious watcher on the hill tops knew no bounds when he saw that his prediction had been verified. Here was as proud a victory as genius ever won. It was a revelation to men of the greatness of their race, and of the great things of which the human intellect was capable. Here was a victory at once over the mysteries of nature, over human ignorance, superstition and terror.

There were two errors held by men through long ages that were barriers in the way of progress, because they were wrong, and because they were so religiously and persistently held. The first of these was that the earth was the centre of all these movements above and about it. Certainly, if appearances counted for anything there was much to be said in its favor. Everybody could see the sun and moon rise and set. Yea even the stars also, but who ever saw, or felt, or heard the earth move? Were not all these rolling orbs and spheres created and set in motion for no other purpose than to serve the earth and her noble race? Was not this planet a very Joseph to whom the sun, moon and stars were to make obeisance? We do not wonder that such a conceit should fight hard to live; it was so flattering to the pride of man.

The other error was that all these visible movements were in exact circles. So evident did this seem to all who took any interest in the matter, that the circle came to be thought an attribute of Deity, a thing of beauty and a joy forever. What a rude shock to such enthusiasm it must have been, to discover that in the movements of the vast machinery of the universe there is no such thing at all as an absolute circle. It is said that the satellites of Jupiter move in circles, but even that cannot be, except in an apparent or relative sense, for if the planet moves through space at the rate of nearly thirty thousand miles an hour, the actional motion of her satellites must be that of a long spiral. So if we take into account the movements of bodies through space, there may be nowhere an exact circle.

To go back to the first of these errors, that the earth was the centre of planetary motion. Pythagoras taught the sun should have the honour. His only or chiefest argument seems to have been that as fire is superior to dead matter and the sun was a ball of fire, therefore it should control. Nicetus, his immediate follower was more bold and claimed that the apparent motion of the heavenly bodies was caused by the earth's revolution around the sun. Hipparchus argued that if the sun and moon moved in exact circles then the earth could not possibly occupy their centres. After Hipparchus came Ptolomey who strongly affirmed and taught the old doctrine that the earth was the great centre around which the sun, moon, planets and stars all revolved. By an ingenious system of circles and epicycles, he was able to explain the seeming irregularities in the movements of the sun and planets. His system, full of error as it was, held mankind in its strong hand for fourteen hundred years.

Copernicus of Poland, after long and patient observation was convinced that Mercury and Venus revolved about the sun on which the earth was just as dependent for light and heat as they. If these two revolving bodies had the sun for their centre, then why not the earth also? For long ages the perturbations and apparent irregularities of the planets had plagued the minds of astronomers more than any other thing

and the difficulties were constantly increasing. Copernicus thought that if the sun was chosen as the centre of these planetary movements, many, if not all the difficulties would disappear. Hindered by the strong prejudices of many, and more or less perplexed with doubt, he hesitated long in declaring his convictions. At length with a strong desire to know only the truth, he tore himself away from old unsatisfactory theories and in imagination, placed himself in the sun, and from thence worked out his intricate calculations. From thence the oscillations of Mercury and Venus became regular revolutions nearest to the sun. Next to them, the earth ; then Mars, Jupiter and Saturn moving on majestically around the sun. Having satisfied his mind respecting this great fact, he turned to the moon to find out what had never before been even suspected, that she was a satellite of the earth. The old doctrine of Ptolomey with the immovable earth as the centre of all astronomical movements, and with circular orbits only, had been woven into human learning and society and was not to be easily expelled. Copernicus himself had not opposed the circle, so there were difficuties still which some one coming later must solve. He had done much to simplify astronomy in removing the centre from the earth to the sun.

It now remained for another to determine the exact curves in which the planets moved: the laws which regulate their motions and the bond which bound them all together, if such a bond existed. God sent Kepler who has been called, "The Legislator of the Heavens," a pious and unprejudiced man, who sought by prayer for truth and then worked as if prayer was of no avail without work. Having adopted the ideas which Copernicus had propounded that the sun was the true centre with the planets, including the earth, revolving around him, he selected the planet Mars, to discover if possible the true curve, which would reveal orbitual motions of the heavenly bodies. After 8 years of incessant toil in which he had tested no less than nineteen different hypotheses of circular motion, none of which could account for the perturbations of the planets, he threw them all

away and resolved in the face of thousands of years of human admiration for the circle, to abandon it as an impossible orbit for the planetary system. By adopting the ellipse he was soon able to demonstrate that the circle as a planetary orbit was an illusion. Difficulties hitherto apparently insurmountable vanished, and Kepler gave the world his first law, viz: that "Planets revolve in elliptic orbits about the sun, which occupies the common focus of all these orbits." Kepler conceived the idea that the planetary system was not an independent group of shining worlds but a fractional part of a system, immeasurably greater, to which it was joined by some common bond as natural and as certain as that which binds the planets to the sun. For seventeen years he wrought almost incessantly upon this problem. Once in his experiments he was on the right path but an error in his computation set him astray and he turned away almost in despair. After some months he set out in that same path again, discovered his error and corrected it, then toiled on.

The mathematical formula on which he wrought was, "The square of Jupiter's period is to the square of Saturn's period, as the cube of Jupiter's distance is to a fourth term, which he prayed might prove to be the cube of Saturn's distance." When he had finished, after testing for seventeen long years every conceivable theory, he compared the result with the cube of Saturn's distance and found that they were the same. He went over the figures again and again. He tried the proportion, the square of Jupiter's period with the square of Mars' period as the cube of Jupiter's distance with a fourth term. He compared it with the cube of Mars' distance and found them the same. He tried other planets with the same result. The man was frenzied with joy. He had discovered the law which makes a brotherhood of all the worlds.

The squares of this periodic revolution are as the cubes of their distances, the struggle of seventeen long years was ended. His soul was so filled with ecstacy that in the excitement of his triumph he exclaims, "Nothing holds me, I will indulge my sacred fury, if you forgive me I rejoice, if you are angry, I can

hear it. The die is cast, the book is written to be read either now or by posterity, I care not which, I may well wait a century for a reader since God has waited more than five thousand years for an observer."

We must not suppose that these great events, so interesting to us, were equally so to all of the learned world of those days. There was a conservative clinging to old ideas which made progress difficult, no matter how illogical and absurd some of those old notions were. When a new planet was supposed to have been discovered, especially some of the asteroids, the sturdy followers of Ptolomey declared with much vehemence that as there were but seven openings in our head, two ears, two eyes, two nostrils, and a mouth, so there could not possibly be more than seven planets in the heavens.

Galileo, in his earlier years fully believed and taught the doctrines of Ptolomey, (the earth is the centre and does not move)—but as a sincere enquirer after truth, he while yet young changed his mind and adopted the system of Copernicus. From Jensen of Holland he learned that an instrument could be constructed which would bring distant objects quite near. He was not long in constructing the telescope. By means of this instrument the greatest of all additions to the outfit of the astronomer, he discovered the satellites of Jupiter and awakened the ire and fierce opposition of the old school. Another discovery went far to confirm the teachings of Copernicus. The Ptolomaist had argued that if Venus revolved about the sun as Copernicus had taught, then she would undergo the same changes as the moon. The Copernicans admitted that the argument was correct, but there was no way of proving it as the distance of the planet from the human eye rendered it impossible of proof by observation. When however Galileo turned his new instrument toward the planet at her proper place in her orbit for such an observation, lo! there she was in crescent shape, a miniature new moon! The Copernicans were triumphant. Here was an event which ranks among the chiefest. It confirmed invention as an aid to mathematics, and to ordinary observation. The eye had done much, but the telescope and the eye were to do much more.

When Kepler had finished his great work and had given to the world his imperishable laws, he conceived the existence of a powerful central force by which the planetary movements were controlled. He had wrought out the fact along the line of strict mathematics. Some one must come later to apply the rules of logical reasoning to see if these could be made to harmonize. Isaac Newton seemed to have been qualified by nature for the work necessary at this period in the history of astronomy. His careful reasoning worked out the universal law of gravitation. He began the study of the law of forces; of force applied directly, of forces applied at right angles, and at different angles. He applied his logical process to the moon falling towards the earth under the powerful influence of the planet's attraction but prevented from ever reaching the earth because of an impulse from a secondary force resulting in an orbitual curve. Newton's logical reasoning and discoveries have done more than the works of any other of his class of philosophers to simplify astronomy, bringing it within the research of the artizan, or even the school boy. We English speaking people are so proud of Newton, we would like to put him at the head of the long list of those great men who have been counted masters of the heavens. I am not sure that this would be quite just. He may well be ranked among the foremost however, of those mighty men who have put our race under everlasting tribute for the service they have rendered by their self-denying perseverance.

I must here refer to Bode's law respecting the distances of the planets from the sun, the discovery of which must be regarded as one of the great events of astronomy. Prof. Bode accepting the suggestion that such a law must exist, after careful investigation arrived at the following ingenious arrangement of figures to represent these proportionate distances. As the densities of the planets must affect the law, and we cannot be absolutely certain respecting these densities, no figures can probably do more than give us a near approximation. Bode's series of figures are to say the least of it, intensely interest-

ing. He puts the series, 0, 3, 6, 12, 24, 48, 96, 192, to each of which he adds the number 4.

0	3	6	12	24	48	96	192
4	4	4	4	4	4	4	4
4	7	10	16	28	52	100	196

The sums obtained represent, as nearly as possible, the distances proportionately of the several planets from the sun, as follows

Mercury	36,000,000
Venus	54,000,000
Earth	95,000,000
Mars	145,000,000
Asteroids	250,000,000
Jupiter	472,000,000
Saturn	906,000,000
Uranus	1,800,000,000
Neptune	3,000,000,000

In the year 1838 the Astronomer Royal of England found by careful calculation that the planet Uranus was out of its supposed orbit about a quarter of a million of miles. At first it was thought that either some comet was affecting the planet or that the laws of gravity were somewhat relaxed at that great distance from the sun. These apparent perturbations of Uranus set a few men at work to find out the real cause.

If strict justice were done, Mr. Adams of England should have the honor of first making the discovery of another planet in our great solar system. However, the Frenchman Leverrier is equally entitled, for their calculations were quite independent of each other, and his was made public a little earlier. The Frenchman had not only discovered the existence of this planet but had correctly assigned it its true magnitude, distance and velocity, and all by pure mathematics. Here was one of the greatest events of an astronomical kind that had ever occurred. Human genius had triumphed as never before. Who can doubt the greatness of the human mind? Leverrier's success cannot be regarded, however, as an independent triumph. It was a glorious culmination of the efforts of a thousand years. That does not detract from the glory of

the event, it merely distributes that glory among a long list of some of earth's most noble sons, and makes many great instead of one.

That a man—that men, should be able, after long centuries of painstaking and toilsome preparation to reach out into space three thousand millions of miles and measure and weigh and locate a world which had never been seen by any but the eyes of God and his angels, overwhelms us with admiration for the race to which we belong. Surely the words of the Psalmist may here be applied to some men at least, "Thou hast made him a little lower than the angels and hast crowned him with glory and honor." "Thou hast made him to have dominion over the works of thy hands: thou hast put all things under his feet."

The planet Neptune is said to be 250 times the size of the earth and requires 166 of our years to pass around the sun. It has one moon which is larger than our planet though its distance from its primary is no greater than that of our moon from us. The planet has also a ring. The discovery of Neptune stands alone in the records of astronomical science. Nothing like this had ever before occurred and nothing like it has since been done. What shall we say of the future? There may be other members of our great family we may do well to look after.

When Halley predicted that the comet which bears his name would return in about seventy-five years, his prediction led scientists three score years later to calculate the exact time when the comet might be seen. They were thirty days wrong, the comet being that many days late in appearing. Shortly afterward the planet Uranus was discovered. Here was the explanation of their error. This unknown planet had been holding the comet back and they knew it not. When Halley's comet appeared the second time since his death the calculators were nine days out in their calculations. Since then the planet Neptune has been found. Here again is an explanation of their supposed error. We may look for Halley's comet again about ten years from now. If our calculators

are not absolutely right this time, I think there will be some little ground for thinking that there may yet be still another planet belonging to our system out in space, more than five thousand millions of miles from the sun. There is no more extravagance in this thought than there would have seemed to have been if one had predicted a century ago the discovery of Neptune. Extravagance, did I hear some one say? Why, sir, we are dealing with a subject where the wildest extravagance of the mind of mortal man becomes reasonable; where the most unbridled imagination of man loses heart and lags behind in its struggle with actual reality. Nowhere else is the proverb more fitting than here. "Truth is stranger and greater than any fiction can possibly be." When we meditate on the greatness of God and his wonderful works, we can see no opportunity for extravagance of imagination. It is a dwarf. Reality only is gigantic. The German poet Richter has given us his lofty thought on this theme, "God called up from dreams a man into the vestibule of Heaven saying: "Come see the glory of my house." To his servants near the throne he said "Strip him of his robes of flesh; cleanse his vision; put new breath into his nostrils, but touch not with any change his human heart, which trembles and weeps." It was done, and with a mighty angel for his guide, he began his voyage through endless space. Sometimes with solemnity of the flight of the angels' wings they sped through saharas of darkness, through wildernesses of space, which divided worlds of life. From distances which can be reckoned only in Heaven, they swept on towards dawning light. Light by unutterable pace came on to meet them, till in a moment the rushing of worlds was upon them and the blazing of suns was about them. Then came eternities of twilight whose depths were not and could not be revealed. On the right hand and on the left towered mighty constellations built up of triumphal gates whose architraves and archways rose to altitudes which were ghostly from infinitude; without measure were the architraves, past number the archways, beyond memory the gates. Depth was swallowed up in height insurmountable, height was swallowed up by

depths unfathomable. Suddenly as they rode from infinite to infinite a mighty cry arose that systems more mysterious, that other worlds more numerous and great, that other heights and depths more profound were at hand, were just upon them.

The man stopped and sighed, and trembled and wept, and said, "Angel I will go no farther, for the spirit of man acheth with this infinity. Insufferable is the glory of God. Let me lie down and hide me from the infinite, for end I see none." Then the angel said "End is there none to the universe of God, neither is there any beginning."

THE RELATION OF MATTER TO SPIRIT.

Read before the Hamilton Scientific Association, May 9th, 1901.

BY. J. BAUGH, M. D.

The good Bishop Berkeley denied the existence of the external or the material universe ; but as a remedy for the bodily ailments of mankind, he had an almost boundless faith in the hygenic virtues of tar water.

Hume, following some of the conclusions of Berkeley, based his metaphysical theories on perceptions, and thought that existence was reducible to a train, or series of atomic sensations, which had no relations to one another. His theories, therefore, took little or no account of experience. While Kant, who followed Hume, theorized that experience was the only legitimate object of reason, and that to transcend experience would lead inevitably to self contradictions. Such subjects, therefore, as God or the soul were according to Kant's theories, outside the province of man's reason and it was deemed necessary by him in order to find a place for faith to deny a knowledge of God, freedom and immortality. If, however, we lay aside the metaphysical speculations of Kant and take up the conception of his gaseous cosmogony, based on a knowledge of physics, it may be possible for us to see a great deal of God and to have a very extensive knowledge of Him. We must admit that Kant laid the foundation upon which Laplace built his wonderful, yet simple, theory of the origin of the material universe and of our planetary system. The Laplace theory, dating from the last quarter of the eighteenth century asserts that our planetary system originated in a fiery cloud, or nebula, and this is now generally accepted by astronomers and other scientists as reasonable and true. This fiery

nebula, or mass of molten matter of Laplace, whirled and revolved through space with great velocity; and as it revolved, some parts of it became detached and were thrown from it. These detached fragments continued to revolve in the same direction as the parent body and now are known as planets. One of these fragments became our earth; and the earth also, at some period of its wandering journey to a distance of about 95,000,000 miles from the parent body, threw off a part of itself; and this part became the earth's satellite, the moon. The earth gradually cooled till its surface presented conditions suitable for life. It is conceivable that there was a time when matter did not exist in any form. The universal Spirit, or God, reigned in awful silence through infinity, whose bounds and form are unknowable and incomprehensible to man. Let us then endeavor to explain the origin of the matter that composed the fiery cloud which gave birth to our earth and the other planets, stars, satellites and asteroids. The only reasonable hypothesis we can offer in connection with the subject is that matter was a conception of, and an emanation from the universal Spirit, or Creator. In other words, spirit conceived and brought forth matter. But conception according to our finite minds implies motion; and without matter, there can be no motion. Prior to the creation of matter there were no ethereal undulations nor ethereal vortices, because the existence of these would imply motion. The act of the conception of matter then by a non-material spirit would seem to us miraculous and incomprehensible if we did not know that it was and is the spirit that thinks and conceives, and that matter is only the medium or means through, and by which, thought and conception are expressed. The brain matter does not think, but the spirit that animates it. I will just say in passing that scientists cannot accept the theory of some theologians that a non-material spirit may also be a substance. Spirit and matter alone exist in the universe. The latter a creation of, and subject to the former. Matter, when first created was probably in an amorphous, or ethereal state; and the first definite elements evolved were probably oxygen, hydrogen,

carbon and nitrogen, because from these four elements many of the primary organic as well as inorganic compounds were formed, though these four elements, as well as the other sixty odd elements, which followed in the order of requirement, would seem to be but variations of the one primary elementary matter. But with matter came motion, and when the motion became sufficiently great to generate the necessary degree of heat (heat being atomic motion or the result of atomic motion) the whole material creation would become a molten mass, which would emit or throw off various gaseous compounds. During these mighty operations in which the whole material universe was brought together, the intensest degree of heat and the highest degree of pressure would be generated and exercised; and the primary amorphous matter would assume the stable and definite elementary forms in which we now find it.

We have now briefly gone over the origin of the material universe ; let us now endeavor to show how life originated on that part of it known as the earth. Matter is void of consciousness and intelligence. Its properties of inertia and gravitation do not indicate life; neither do its properties to attract or repel and to combine to form inorganic and organic compounds. They simply denote that matter acts in accordance with certain laws given to it by the spiritual creator. The light and heat of the sun acting on humid earth cannot originate life. They are but means for the developement of matter that has been vitalized. The vitalizer is God, and it is He who guides matter from the dead inorganic to the living organic. Nor can the chemico-physicist originate life in his laboratory. He has been able to imitate nature in the formation, synthetically, of many inorganic and organic compounds ; and he may even make artificial protoplasm, but he has not up to the present time been able to endow it with life. Whether the first living organism was animal or vegetable we do not positively know. The Zooid or the Zoophyte, a variety of compound animal and plant, may have been the beginning of living things, but this is only conjecture. Assuming that the Zooid or the jelly-fish were the starting point of living things,

millions of years must have elapsed to admit of the evolution of the animal and vegetable kingdoms by divergence, variation and natural selection. Parthenogensis can explain how one organism may reproduce itself by autofertilisation, but this so far as we know takes place only in the lowest forms of organic life. Following the assumption that the animal and vegetable kingdoms did originate in this way, we cannot avoid the necessity of making use of variation, adaptation and natural selection ; and the axiom of Herbert Spencer that all living things undergo a ceaseless transformation through a continual adaptation of organisms to environments, must be accepted and applied. But it signifies little how low the organism from which the animal or vegetable kingdoms sprang, the matter of which that organism was composed did not do the varying nor the selecting. The matter, *per se*, could do nothing ; but the life and intelligence which animated it would vary and adapt itself to environments and, if necessary, make new conditions to enable it to complete its design and purpose. The laws of matter and the so called laws of nature are nothing more than the laws of the Creator. Whether His laws are mutable or otherwise, I will not attempt to discuss. His laws however may, and do, guide the operations and divergence, variation and natural selection in order to attain the ideal, a part of which we may reasonably infer is man.

According to the Mosaic account, the first human organism was a spontaneous production and this reproduced itself by some kind of parthenogentic process. Evolutionists, however, do not consider this evidence sufficiently authentic to command their acceptation of that occurrence. The science of embryology and cytology are both opposed to the biblical story. Both these sciences teach and demonstrate that the living primary cell of an organism is as much an entity as the aggregation of its progeny in the form of a specific organism. The primary cell of a human organism after its fertilisation by impregnation proceeds by division, reproduction, differentation and collocation to produce the organism of its

kind. To carry out this wonderful process on the part of the microscopic primary cell.

Let us make this clear ; the life, comprising the intelligence, energy and subjective consciousness of the primary cell, unfolds and expands to produce the growth and formation of its specific organism. This unfolding and expanding of the life, or soul of the primary cell proceeds *pari passu* with the growth and formation of the organism. Haekel says a new born babe has neither intelligence nor consciousness. I consider his statement erroneous, and I do not hesitate to say that a new born living child possesses an intelligent subjective consciousness, which gradually unfolds into an objective or individual consciousness. The relations then, subsisting between matter and spirit are definite and distinct ; and no scientist of repute ignores the operations of the universal spirit in the evolution of the material universe, nor fails to recognize the fact that a supreme power continually energizes and controls all the natural phenomena in both animal and vegetable kingdoms. Man's life, intelligence and individuality then, constitute his spiritual nature, and show his relation to God from whom it came and to whom, after dissolution, it will return. Man's soul is in fact an integral part of the universal soul, or spirit. Memory, the will, reason and judgment are but attributes of the spirit and part of the intellectual armamentarium.

As I cannot conceive of shape or form without matter, I will not attempt to show what the spirit, or soul of man will be like when it becomes separated from the material body at death ; nor will I discuss the qualitative and quantative properties of the soul in man and other animals, but I will leave it for others who may think themselves more competent to say whether or not, it be possible for a non-material spirit to assume and maintain for an indefinite period of time the shape, form and identity of the material human body with which it was associated prior to dissolution.

ANNUAL REPORT

OF THE

GEOLOGICAL SECTION

OF

THE HAMILTON SCIENTIFIC ASSOCIATION

For the term ending May 9th, 1901.

To the President, Officers and Members of the Hamilton Scientific Association:

The members of the Geological Section have much pleasure in submitting this, the annual report for the session ending May 9th, 1901.

The work of the session has been carried on with the the same enthusiastic spirit that has prevailed in the past, each member striving to do what he considered best in the interest of the Section, to promote and further the objects so manifestly evident in like institutions and to foster and develop a better acquaintance with this great and important branch of science.

Many new specimens have been added to the museum during the last year, some of them new species. These were collected from the Barton beds, the Niagara chert and underlying beds in the Clinton formation, the Cambro Silurian, or what is most familiarly known as the Hudson River boulders and shingle at Hamilton and Winona.

The acting chairman, Col. C. C. Grant, has sent a large number of fossil specimens to different museums, The British Museum of Natural History, The Dominion Museum at Ottawa, The Washington Museum, and others. Mr. E. Ray Lankester, director of The British Museum of Natural History, has

acknowledged the receipt of 30 interesting specimens of Graptolite and fossil Sponges from the Niagara growth of rocks at Hamilton, Ontario.

Prof. J. F. Whiteaves, Director General of the Geological Survey of Canada, acknowledged the recept of 16 parcels containing 180 specimens, also another lot of 30 and another of 48 specimens, the last lot being composed mostly of fossil sponges from the Niagara chert beds; in all 244 specimens.

Mr. James Douglas, Secretary of the Public Library Board of St. Catharines, on behalf of that board acknowledged the receipt during last year of a very interesting collection of fossil specimens from the acting chairman of the Section, and intimated that the board was so pleased with the donation that to mark their appreciation of the gift, they had decided to have a special case made to hold the specimens and were going to place it in a conspicuous place in the Library.

The published proceedings of the Smithsonian Institute of Washington, D. C., just issued for the year 1898, credits Col. C. C. Grant with having sent to the Institute 53 graptolites from the Niagara formation at Hamilton.

Thus you will readily see that the Section has been busy during the past year in disseminating in a very practical way some knowledge of the geological records as revealed by the fossil illustrations sent to different parts of the world.

This work of the Section has also brought into prominence the desirable fields of labor for the student of geology and collector of palæontological specimens which lie so conveniently to the City of Hamilton.

As has been suggested by the acting chairman, in view of the fact that the Geological Section of the Hamilton Scientific Association has contributed more specimens than any other city to the Dominion Museum at Ottawa during the last three years, why should we not receive from the Federal Government an annual allowance to enable us to print for distribution the proceedings of the Hamilton Association in a larger volume and have it fully illustrated? Also to enable the

Section to have sections of fossils made with the view of identifying them at home instead of sending them to specialists who sometimes fail to give credit where credit is due.

Your section wishes to place on record the regret it feels that the very fine collection of shells owned by Mrs. Carry has been removed to other quarters.

The museum has been kept open Saturday afternoons to allow any visitor or student to view or study the specimens contained in the museum under the care of the Curator and his assistant, accompanied by Col. C. C. Grant.

Many of the boys and young men have taken advantage of this opportunity to make themselves acquainted with the various objects of scientific interest.

During the term just closed the Section has held five regular meetings at which papers of geological importance were read. Following are the dates and the subjects :

Dec. 1st, 1900, Opening Address.....C. C. Grant.
Dec. 22nd, 1900, " " ..... "
Feb. 26th, 1901, Niagara Falls as an Indicator of Time..... "
Mar. 29th, Geological Notes..... "
April 26th, " " ..... "

All of which is respectfully submitted.

A. T. Neill,
Secretary.

C. C. Grant,
Acting Chairman.

OPENING ADDRESS, GEOLOGICAL SECTION.

BY COL. C. C. GRANT.

My first visit during the past collecting season, outside the city quarries, was paid to a field on the brow of the escarpment which for many years has displayed Niagara chert sponges and their sections ; the snow had disappeared in the city and I considered a sufficient time had elapsed for the field to be dry enough for examination. In this, however, I was disappointed, so resolved on the following day to ascertain if the frost had brought down any fresh material from Burlington Heights at the Desjardins Canal. Very little debris had fallen since visited during the autumn previous, and only a few of the water-worn pebbles and shingle presented any indications of being fossiliferous. I extracted from a mass of the conglomerate, a hard purple limestone which I found from experience on the lake shore at Winona was likely to hold specimen of the Ostracoid named by T. R. Jones, F.G.S., *Leperditia Canadensis*. On splitting it, the well known organisms presented themselves numerous as ever, together with a Modiolopsis and wing-shell, common to the Trenton and Hudson River series, probably. In the absence of more likely material I commenced breaking up some rather unpromising limestone and Medina freestone pebbles and was agreeably surprised to find in the one, a large Murchisonia, while the white sandstone displayed a *Lingula* allied to, if not identical with *L. Clintonensis* which as far as I can learn has not been discovered in this series hitherto. More recently another visit was paid to this locality in the belief that the heavy rain falls lately might have affected and released some more of the Conglomerate overhead, this conjecture was found to be correct on examination and although we cannot claim the discovery of any specimens unknown to scientific research, a considerable

number of well preserved Cambro-Silurian fossils were obtained for distribution, while a few ones, rare in the ancient and modern beaches were placed in the museum cases—the latter included *Modiolopsis pholadiformus*, Hall, which he describes as Hudson River from Lake Superior. The slab contains also *Lyrodesma poststriata* (Emmons) which has already appeared in Dr. Spencer's list of drift fossils of Hamilton. It was figured in "The Palæontology of Ontario" by the late Dr. Nicholson, F. G. S. An exceedingly fine Trenton fossil, the large Murchisonia bellicincta, Hall, was obtained from some lake shore gravel used in filling up a hollow close to the sidewalk between the entrance to Bolderwood and the gate of the Asylum. This was merely a chance find—but it proved that the most unlikely-looking material may sometimes contain inside the unexpected.

THE CITY QUARRIES.

Taking into consideration the numbers of men employed in quarrying during the past season for macadamizing purposes, the result may be looked upon in some measure as being rather disappointing as far at least as the number of specimens were concerned. On the other hand few seasons have produced in such beautiful preservation graptolites and other organic remains which were revealed by blasting and excavation of late; and strange to say, some put in an appearance where least suspected. The lower portion of the chert beds that from their position were less exposed to weathering and decay, and were regretably looked upon as so barren of graptoliles heretofore, are proving now ill-deserving of this reproach. In addition to *Conularia magnifica*, another hitherto undescribed perhaps, and the large Crustacean, Pterygotus Canadensis, (Dawson) there may be found graptolites undiscovered as yet in the chert above or limestones beneath. As may be expected from their weathered position, the graptolites already found in these beds are remarkably well preserved, but difficult to obtain in a portable form owing to the size and the thickness of the layers. The writer imagined until quite recently that the Acanthograptus (Spencer) was

confined to the upper or glaciated portion of the chert. Such, however, is not the case; and the two species already described by no means represent the complete "genera" of this remarkable Hydrozoa. Some appear to have been "free floaters" in the ancient Silurian Sea while others were moored to the sea bottom by a single stem. As in the case of a *Dendrograptus* which came under observation of the late Palæontologist of the Dominion Geological Survey, Prof. E. Billings, I am inclined to believe in some instances the fossil perhaps in rough weather severed its ties with the part buried in muddy sediment, and went away cruising independently, trailing the stem behind. Still the appearances which led to the conclusion may be deceptive in the case recorded by the Canadian Palæontolagist, as well as in others which came under the writer's personal observation. That free floating Sertularians existed, in the American Mediterranean Seas, both in Cambro-Silurian times and also when our local rocks were deposited subsequently, can hardly be denied (the evidence is too strong for refutation) but it is no less clear that the great majority of these organic remains discovered here had either spreading, funnel-shaped or bulbous roots unplanted in the sea bottom. One of the graptolites most frequently found in this locality is Dr. James Hall's *Dictyonema*. It may be necessary here to give the exact words used by the Great United States palæonotolgist in describing the Genera, because I was rather puzzled to find a form figured as such erroneously in the old country perhaps, viz.: General characters—fronds, consisting of flabelliform or funnel-shaped expansions (circlar from compression composed of slender, radiating branches which frequently bifurcate as they recede from the base). Branches and subdivisions united laterally by fine vine transverse disepiments. Exterior of branches strongly striated and often deeply indented. Inner surface Celluliferous or serrate as in *graptolithus*." In the *Hydrozoon Dictyograptus* (*Dictyonema*) *soriale* of Europe as figured, I am unable to discover any lateral bars whatever. Even Dr. Hall's description of the family must be modified owing to more recent

discoveries in this locality both with regard to the general appearance and the position of the Cellules at least in some instances.

The only shot during the past collecting season in the base of the Niagara limestone (immediately above the upper Clinton green band) revealed a very fine branching Fucoid of unusual dimensions and in good preservation. It appeared in a thin layer, below the Pentamerus bed which sometimes is separate but more frequently incorporated with it. The charge of powder fortunately split the flag along the line of bedding, and did not break it across. As may be supposed from its position, in the centre of a limestone the cylindrical stems have been flattened. The pressure to which it was subjected may have altogether changed its original appearance. I have reason to imagine a fragment of a fluted (grooved) Sea plant which members of the Geological Section often noticed as occurring on the surface of the Pentamerus limestone may have represented a portion of such a Fucoid as the one below it.

The Niagara chert beds or rather the glaciated layers either removed in *the ice-age* or perhaps in some weathered out along or contiguous to the corporation drain during the past season displayed quite a number of fossils, but the two rarest sponges, now in the British Museum, were found in fields adjoining the escarpment, one, undescribed, west of the Glanford road and the other a little beyond the Reservoir. The latter was a tube-like form, a species of *Aulocopina* in good preservation. Mr. A. E. Walker knows the one in question. I have not seen any so perfect hitherto, and as it is rarely met with, and we do not possess a specimen in the museum cases probably, I felt somewhat reluctant about sending it away until on reflection I concluded, if new to science, it had a better chance of being figured and described in the old country than here.

Independent of the two mentioned, several other sponges in good preservation were obtained and transmitted to London through the Parcel Post. I regret, however, we failde to get a duplicate of the very extraordinary one formerly in possession

of our President, Mr. A. E. Walker, representing three or more distinct *Aulocopinas*, rising from a common platform, the platform itself evidently of the same nature as the sponges above, so the connection could not be doubted. The writer felt inclined to look on it as a Bryozoon until it was more closely investigated. In several instances only a single specimen of a sponge has been found, *Balastronia* (Head) for example, another in the Museum, Niagara case, appears a new Genera altogether, but no duplicate has been discovered; the field in which the latter was found has not been ploughed up for some years; it may possibly reward research under more favorable circumstances. The old reliable locality to which I have frequently directed your attention adjoining the corporation drain presented a few rare fossils to Messrs. Bartlett and Schuler but nothing new to self or others, as far as I know. Indeed since the crop this field contained was gathered in, it became almost completely covered with clover, grass and weeds which concealed the chert-flakes. However, on turning over a few which were exposed on a comparatively bare patch, some very fine specimens of Dr. James Hall's *Cladoporæ* were revealed, in the field opposite (other side drain) two fine heads of Trilobites were discovered, one may be the shield of *Lichas Boltoni Var.* occidentalis, Hall, who figures the tail part but not the head, which probably has not been previously found, he describes *Lichas breviceps* from two imperfect specimens, it will hardly come under that head. Another rare fossil which turned up there was a Cornulites, undescribed so far as I can see, the tube is plain, straight but slightly curved occasionally which leads one to imagine it may have been flexible. The most common form of Cornulites in the glaciated chert (upper beds) is *C. bellastriata*, Hall. Mr. Schuler of this section obtained a fair specimen lately when we were collecting in the Drain field. A prevailing impression among the younger fossil collectors here seems to be that the older hands already secured everything worth taking in the shape of organic remains, such as sponges, sections, etc., from fields near the city. I can assure you in refutation of this, it is not borne out by the writer's

experience. The first discovery of Fossil Sponges in our local Niagara Chert beds was made in situ at the rock-cutting of the Hamilton and Erie Railway, the fields adjacent to the bluff overhanging the line contributing many sponge sections. Later on our President, Mr. A. E. Walker, and the writer on examining both sides of the road at the head of the *Jolly Cut*, found specimens there just as numerous and in as good or better preservation than any beyond the reservoir. For over quarter of a century the fields in question have annually yielded large numbers of these and other fossils, but strange to say, during the past season while the sections of sponges were few, the complete forms obtainable were far in excess of any year previous; this may be owing to ploughing deeper which I understand has been recommended lately. Yet even this, however probable, is quite insufficient to convey to you an accurate explanation of this matter. I have no reason to doubt it, but I believe the unprecedented success of the past season in securing such a number of complete chert sponges was chiefly owing to a closer research than usual for this particular family, as well as the plan adopted for many years in the case of flint-flake chert scattered fossils, viz., turning up the portion underneath even when the upper surface displays no organic remains to arrest attention. I attribute to this practice much of the success during the past season as well as to a closer search than usual in the case of the complete sponges. By subdividing and carefully examining the fossiliferous fields by sections few things can possibly escape observation. It must be admitted that much of the time formerly devoted to securing graptolites in the quarries was transferred in the direction of the Niagara sponges. An Astylospongia in situ, near the base of the Barton beds which succeeded the chert was extracted at an early time in summer and placed in a side case. It is a poor specimen, like all from this horizon, but it is of much interest owing to its position in indurated shale which apparently was not favorable to its existence, since this class of fossil does not appear in the succeeding band of limestone near the Albion Mill. The first

specimen obtained from the lower Barton beds was a short distance beyond the rock-cutting on the old Hamilton & Erie line, where a small stream (dry in summer) crosses the road and which forms a little way down the small "Horse Shoe Falls." Later on quite a number were discovered on the rising slope, south of the corporation drain at the base where the shales overlie the chert beds. The fields have not been ploughed up for several years, but many sponges were obtained formerly from the ridge by the late Mr. Turnbull and the writer. Other organic remains have also been found there *Posidonomya* corresponding with one beyond the rock-cutting near Albion Mills (common) Favosites, a fine Lingula larger but not unlike Lingula tæniola (Hall), several specimens of Rhynchonella Tennesseensis (Roemer) may be obtained also from this locality.

The fields near the mouth of the corporation drain towards Albion Mills at the brow of the escarpment, which were found to be so rich in sections of sponges during the two previous collecting seasons, yielded very few recently. This may be attributed to the nature of the crops (clover, etc.) and the small orchard near the Barton and Glanford stone road, from which the fine sponge (now in the British Museum) was obtained at an early part of the year, proved exceedingly disappointing later on ; indeed the same may be said of the one a little higher up at the other side of the road. It merely furnished an indifferently preserved *Astylospongia* and a few sections. This may be owing to its close examination for many years since cultivation. The surface soil is thin there and the Erie clay is absent. As regards the aspect of the ground nothing unfavorable was noticed, and it was sufficiently uncovered to enable one to see the fossils if they were to be had at all.

It may be within the recollection of members of our Section that at one of our meetings last year a brief discussion arose regarding parasites attached to sponges. The plain globular dense-spiculed one in the Niagara chert beds had apparently some attraction above others for a Bryozoon (Lichenalia)

and a Brachiopod resembling a young *Rhynchonella Tennesseensis*. The writer remarked that in some instances the reverse had occurred seemingly, and the sponge (in a young stage) had fixed itself on shell or polyzoa as may be noticed in modern seas. Ample proof of the correctness of this view was clearly displayed in the case of two or more Aulocopinas lately. It would be erroneous to suppose that the weathering process is in every instance necessary to display complete forms of the sponges. The one figured and described by the late Palæontologist of the Dominion Geological Survey, E. Billings, *Aulocopina Granti*, had no chert enveloping it, and was found with some others (in situ) in a similar condition. It may be admitted, however, that the majority are enclosed in mineral matter (chert) and partly encased ones are not uncommon, with the weathered material adhering. Like the graptolites they seem to have formed colonies in certain fixed parts of the now raised Silurian sea bed here.

The field which produced so many sponges recently which I submitted already for your inspection also displayed a fine specimen of a *Favosites*, an interesting relic of the great ice age, as you may plainly perceive on examination. Perhaps it was combed out of an upper chert (glaciated bed) or a lower Barton layer, since similar corals have been found in both, although of lesser dimensions. In this instance the glacial planing process has effectually accomplished much that can be done with the cutting wheel of the lapidary. The vertical section displayed leads one to suppose it may be a variety of *Favosites Niagarensis*. Hall states in F. spinifera the cells in some are larger than others.

It was mentioned in a Canada paper a few weeks ago that Professor Sollas who had returned from Australia where he had been engaged in ascertaining the thickness of coral reefs, was selected to fill the high position of President of the Geological Section of the British Museum. We trust the statement may be as represented. You are already aware the learned gentleman has figured and described one of our chert sponges from Hamilton. Dr. G. J. Hinde, formerly on the

staff of the Toronto University—one of the old country's leading palæontologists—has also taken very great interest in this class of fossils and is looked upon as one of the best authorities regarding the sponges generally. Many years ago he received specimens from the Hamilton beds, and we may rest assured he would not lose time in investigating the many species which were lately forwarded to the British Museum through Professor T. Rupert Jones.

WINONA AND GRIMSBY.

A shorter stay than usual was made last summer at Winona Park, and only three visits during that time were paid to the Grimsby quarries. The latter presented an unusual number of Upper Clinton slabs containing the well preserved Fucoid of the late Dr. James Hall, *Arthrophycus Harlani*, and the smaller variety of the plant found on the surface of a thin sandstone layer. In the previous summer the debris of the old quarry workings furnished most of slabs containing the fossil, but this spring large masses of the Upper Clintons had fallen down from overhead, and from this alone not less than seven fine slabs were removed when first visited. Later on in company with Mr. Schuler a fourth visit was paid to the locality and we returned to the railway station with a very extensive collection, in fact with as much as we could well convey to the train. The chief portion of my time was occupied in rendering a splendid slab containing the large *Arthrophycus Harlani* sufficiently portable to enable its removal to be effected from the quarry. My companion had secured a varied assortment, many rare *Bryozoons,* etc., but few I think unknown.

Messrs. Schuler and Bartlett subsequently visited Grimsby and informed me they were perfectly satisfied with the specimens secured on the occasion. The former discovered the arms of a crinoid *Eucalyptocrinus* (I was unable to find the body or any plates on the shale slab) and the well known Niagara *Caryocrinus ornatus*. Except when pointing out where fossils were most frequently found, for my part I con-

fined myself to a search for fucoids chiefly which are much admired owing to their excellent preservation there. On one of my visits, however, I got the head of a *Lyriocrinus*; the plates are rather crushed and it looked a little better when partly concealed in the soft shale. The slabs at Grimsby require weathering in order to show the numerous *Bryozoons* on the surface. All the best ones have been already removed by the writer, Nicholson and Hinde several years ago.

CLINTON AND MEDINA.

If any intention ever existed of re-opening the Medina quarries east of the Jolly Cut, it must have been abandoned, or I may have been misinformed, and the difficulty now of obtaining Clinton specimens in the old workings has been increased greatly of late owing to landslides of surface soil from above, which were caused by the heavy rainfall in an early part of the collecting season. This is more to be regretted since organic remains of the series are very poorly represented in our museum cases, and the Clinton slabs especially were highly prized by Palæontologists. Three crinoids found in these beds are unrepresented. Fortunately before the Eastern Incline destroyed the only place where, as far as I know, colored cranias were obtainable, I placed one of the few found there in the upper case. The only one in my own possession was sent not long since to the National Museum, Dublin, claiming that "it retained the original coloring matter" as it was found to exist in the living *Brachiopod* dredged off the coast of Norway. The members of the section may remember the specimen which was attached to a *Flustra* and was submitted to your inspection at our opening meeting last year. The wing shell *Avicula* here displayed comes from the Clinton Iron band which I believe in this locality at least represented a mud flat very slightly elevated above the sea at low water and which was partly submerged occasionally so as to permit burrowing shells to enter, and it may be that the single valves of the *Lingulidæ* found in the band in such extraordinary numbers can be best explained by supposing as

I previosly mentioned pointed to dead shells which had been washed shoreward. As in former years a large quantity of the two upper Clinton beds had to be removed from behind the upper reservoir, loosened by frost in spring and rain subsequently. This debris presented little of interest to ourselves, even when it contributed specimens which scientific brothers of St. Catharines so warmly appreciated in acknowledging their receipt.

WINONA, LAKE SHORE.

I already mentioned, only a short stay was made at Winona Park during the past summer, but the circumstances rendered it necessary to work a little more than usual along the lake shore, and to extend researches more easterly. Perhaps not many new things turned up, but rare specimens were found, and some (in better preservation) replaced poorer ones in our cases, or were forwarded to the Geological Survey Office, Ottawa, and elsewhere.

The fossils now submitted for inspection have been selected especially for the purpose. It is by no means an easy matter (as was already stated) correctly to name a fossil solely from a woodcut and not the original. As regards the general appearance they may correspond, but you can notice minor omissions (which are of considerable importance however,) in many of the figures given in Palæontological works published even less than a quarter of a century ago.

The small turbinated shell whose mouth is imperfectly outlined perhaps is a *Holopea*. On comparing it with several described or figured by the late E. Billings, and U. S. A. papers I failed to recognize any actual resemblance, neither can I recall Anticosti specimens to remind me of it now.

Some fine Trenton slabs were obtained on the lake shore between Winona and Grimsby, east of a small creek whose inlet was closed by a sandbank, when visited; it is some distance from the Park. You will find there a very extensive collection of shingle which doubtlessly contains many interesting *Cambro-Silurian* fossils. The writer arrived rather late on

two occasions, and left the camp before a third visit was paid as was intended. He expects to secure a few specimens from the locality yet next summer, having noticed a considerable amount of material there which seemed highly fossiliferous while a large portion of it seems to be above the reach of the lake waves even in the roughest stormy weather.

Only a few visits were paid to the Waterlime beds above the Albion Mills, and nothing new was obtained; but in the glacial clay resting on the Barton Niagaras, among some fragments of chert, were a few sections of sponges including a well defined transverse section of *Astylospongia*. You may remember the chairman, Mr. A. E. Walker, found at or near the base of this *Erie Clay* a well marked tail shield of *Asaphus Platycephalus*. I noticed a statement in a Toronto daily paper lately, that Dr. G. Dawson, Director of the Dominion Geological Survey, has just discovered quite a number of microscopical objects in this deposit. It may be necessary to mention the circumstance. Many members of the Association I am told, who do not belong to this section, are desirous of acquiring objects for their microscopical investigations. Since the *Cornulites* figured in last year's proceedings was shown a better specimen was obtained from the glacial chert. In forwarding it to the old country I suggested for it the name *Theca Niagarensis*, if it proved to be a new species as was supposed.

NOTES ON A FEW FOSSILS.

Since the publication of "Number XVI Journal and Proceedings" I obtained a better specimen of the Cornulites therein figured which has been submitted to an expert for his examination. If it proves to be a new species, as I believe it to be, I suggested the name *Theca Niagarensis* may be appropriate.

I have also to call the attention of the Section to some remarkably fine graptolites from the city quarries recently obtained. The *Dictyonema* from blue building beds, Niagara, seems new. A portion of the top branch was noticed by Mr. Nichol who put the flag aside for me, and I succeeded in developing it subsequently with the chisel. The other graptolite came from the lower part of the chert, barren of this class hitherto as we considered.

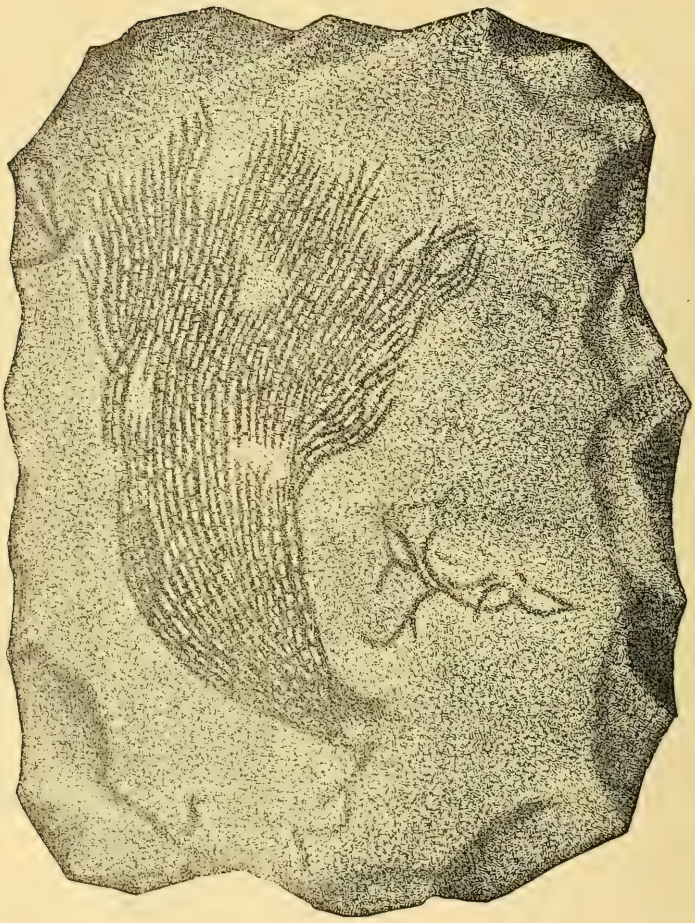
The Orthis (Winona lake shore) was named *O. Carlugi (Hall)* but on comparison with Salter's figure of *Orthis retrorso*, the identity appeared so clear I referred to Schuchert's work on the *Brachiopods* and ascertained the correctness of this view. It has not been mentioned as a Hamilton drift fossil, but has been found in Canadian Hudson River or Trenton rocks elsewhere.

Among the fossils obtained last summer at Winona Lake Shore, Ontario, was one I put aside for your inspection at the last meeting of the Section, but unfortunately it got mislaid and was not in the parcel whose contents you examined. It represented a species of *Grammysia* probably and occurred in Cambro-Silurian drift. The name was first applied (Gramma) a lime and Mya (Mussel) to a *Devonian Lamelibranch* in 1847, in allusion to a transverse furrow crossing the valves from the umbones to the middle of the ventral margin. On consulting a work received from the late Dr. James Hall, I find he named

species as occurring in the Carboniferous and Chemung groups U. S. A. As it has not been found hitherto so low down I forwarded it to the Palæontologist of the Survey at Ottawa for description if new to science.

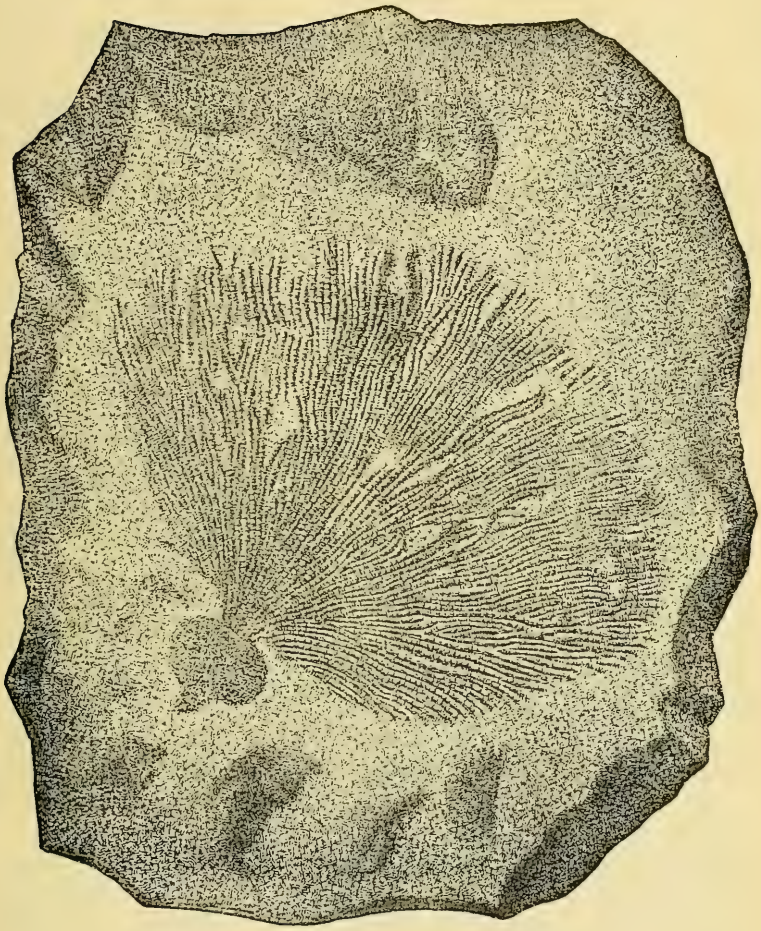
I have also to call your attention to some fine graptolites recently obtained from the quarries at the head of the Jolley Cut road.

In a catalogue of sponges by Dr. Head, of Chicago, it is stated that the celebrated German spongiologist, Professor Rauff, has already named the following Niagara sponges from Hamilton, Ont., viz. : *Oncosela Catinum*, *Anomoclonella Leteli*, *Chlastoclonella Headi*.



No. 1.

No. 1 represents a trumpet-shaped *Dictyonema*. As far as I know it may be new to science on this continent. This may be said probably also of the larger one, No. 2, on page 77, which appears to belong to a bulbous-rooted member of the family. It may be noticed the connecting bars are few in the species. The above occur at the base of the chert beds.



No. 2.—⅔ size.

NIAGARA FALLS AS AN INDEX OF TIME.

Read before the Hamilton Scientific Association, Feb. 26th, 1901.

BY COL. C. C. GRANT.

The writer has often been asked whether it was possible to form any opinion regarding the time which has elapsed since the Glacial Age. The reply I fear must be in the negative. One of the most conspicuous features of this locality is the ancient lake beach, known to us as "Burlington Heights." Standing on the summit of that vast ridge near the Central School, one must reasonably conclude it must have taken many thousands of years to pile up the enormous amount of sand, gravel and water, rounded boulders and shingle accumulated. We know it overlies "Erie" or "Glacial" clay. We possess no other indication as regards the lapse of years until we come to the recession of the Niagara river, and there we have a very interesting matter for contemplation, since it cut back its bed from the lake shore to the site of the present Falls.

On one of Dr. James Hall's visits to Hamilton the conversation turned on calculations of Sir Charles Lyell, who stated it must have taken about 32,000 years to excavate the Niagara gorge. Forgetting at the moment the Dr. accompanied Sir Charles on his visit to the Falls, I ventured to express a belief that, as no landmarks had been laid down at that early period, it was difficult to see how he arrived at this view, seeing that formerly different conditions existed from what prevails at the present time; and it could be easily seen that the soft shale which lies at the base of the Falls did not occupy that position lower down the river. He reminded me he accompanied the famous British geologist on that occa-

sion and published a paper in 1843 on "Niagara Falls: its Past, Present and Prospective Condition," a copy of which he would send me on his return to the States, which I duly received. An answer to the remark made, may be noted in the pamphlet as follows, viz.: "All the historical evidence "that we possess upon the subject proves the falls to have "receded, and although there have been no monuments estab- "lished yet the representation of early travelers when compared "with the present condition of the falls, proves that a change "has taken place, though we cannot be certain of its precise "amount. The accompanying view he adds is a *fac simile* of "the one published in Father Louis Henepin's travels, 1678, "and though rude and fanciful it is in many points of view "highly interesting and important." The landmarks in question have long since been laid down which enable us to note the rate of recession now. Dr. Hall shows the absurdity of the belief (which I can hardly fancy was ever entertained by any field geologist acquainted with Lake Erie) that when the river was cut back to the lake a sudden drainage would result in the submergence of the country to the north and east. This he states would leave no deluge of any importance. However interesting the work may be deemed from a geological point of view, we must not forget that much has been learned since then regarding the river and the locality, and doubtless subsequent writers profited largely by the Doctor's suggestions, as well as by the landmarks placed by the New York State Geological Survey to enable us to note with accuracy the recent recession of the Niagara gorge.

Probably Dr. Spencer's survey of the district is more accurate than any hitherto published on the subject. What was once in a great measure mere conjecture now becomes almost a positive fact. Not a single feature of the Niagara gorge escapes his observation, and after what was evidently a most careful systematic examination he concludes "that Lyell's estimate was very nearly correct," and if the Ice Age ended with the birth of warren water, then we can roughly estimate it to date back some 59,000 or 60,000 years.

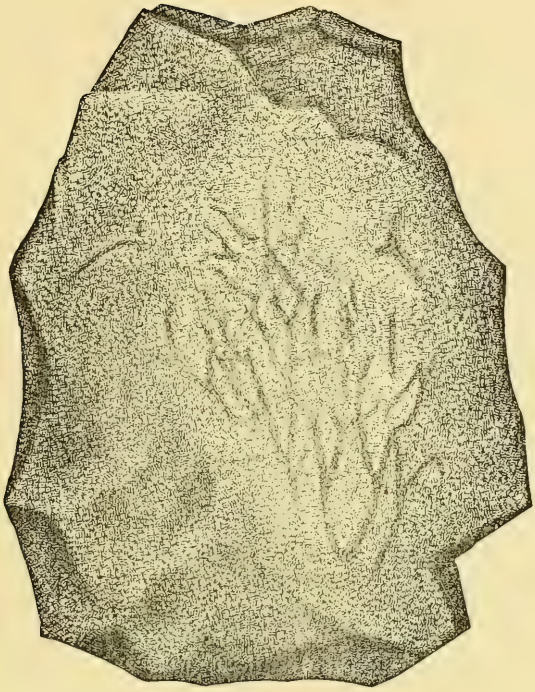
By following up the small break at the Albion Mills (almost dry in summer now) you will find it presenting in miniature a close resemblance to the changes, cascades, etc., recorded by Dr. Spencer in what we may designate as "the Barton Waterlime Niagara beds" which overlie the local chert, in other words "the macadamizing rocks" of the escarpment to the south of the city. That the series may present a totally different aspect elsewhere may be certainly expected. Is not this evident by comparing the Clinton Iron-band of Hamilton with the rocks of the same horizon at Grimsby? "The recession of every mile," remarks Hall, "changes the whole aspect; new elements are brought into operation; the nature of the strata varies." True, and we may add the mineral composition of the same beds also, within exceedingly short distances. The writer noticed this many years ago in the mountain limestones in Ireland, and the same peculiarity was observed in a Niagara quarry west of the Jolly Cut. The bed here, remarked one of the men employed there, resembles marble of the old country. He was quite right. These are facts which have not been taken into consideration by some geologists regarding the recession of the falls. Here I wish to call your attention to a prevailing error in Ontario, viz., confounding the branch of the science, "Palæontology," with the principal, "Geology." A man may be a famous palæontologist, thoroughly acquainted with the ancient organic remains and yet possess little knowledge of "Field Geology." On the other hand, a late Director General of the Irish Survey, celebrated for his field work, informed the writer that he knew little and cared less for the branch referred to, and intentionally abstained from its study, as he did not care to set himself up as a cock-shot for that blooming (he used a different term) fraternity.

In a work by the late Sir W. Dawson, entitled "The Chain of Life in Geological Time," in Chapter X, the Advent of Man, he states the date of the glacial period is however at present very uncertain. On the one hand some geologists like Lyell have supposed it may be as far back as 200,000 years ago. Others, like Croll, are contented with the more mode-

rate estimate of 80,000 years. On the other hand the calculations of Andrews based on the recession of the American lakes, and those of Winchell on the recession of the Falls of St. Anthony, reduce the time to from 7,000 to 12,000 years. It is impossible in the present state of knowledge to settle these disputes. That may be, for much of the conclusion is mere conjecture. For my part I am inclined to believe that when Spencer gives "on or about 50,000 to 60,000 years" he rather underestimates than overestimates the time. In the same page of "The Chain of Life," Sir William puts the question, "Have we any facts bearing on the absolute antiquity of man?" In reply to this he calls attention to a work of Canon Rawlinson, entitled "Origin of Nations," published by the Religious Tract Society, 1878, which shows, he states, conclusively that the historic origin of all the great nations of antiquity extends backwards less than 4,400 years from our own time. Now it so happens neither the Canon nor the great Canadian Palæontologist were aware of the recent extraordinary discoveries in Egypt, Assyria, etc., where ancient cities and tombs have been unearthed by French, British, Germans, Americans, containing the most reliable evidence of powerful and highly civilized nations which flourished some 7,000 and 8,000 years before the time of Christ's appearance. The assertion (erroneous) was made in good faith, but it is hoped that a reverend gentleman who lately informed us through the daily Canadian press that man had degenerated even in size, for formerly he attained a height of 23 feet, did not give Sir William as his authority for this.* He was not likely to mistake the skeleton of a "Dinosaur" (a reptilian) for that of a human being. "The "earliest skeletons known, as for instance Cro-Magnon, Men-"tone and Engis, indicate a people of great stature and "powerful muscular development, large brain, coarse Turanian "features; they used flint and bone implements which they "manufactured with much skill." A larger skeleton than the ones here alluded to has since been found. It belonged to a man 6 feet 6 inches. Although the reverend gentleman

*NOTE.—He only wished to convey the impression probably.

mentions Sir William Dawson's honored name (with his approval) in connection with others of inferior scientific standing, it is doubtful if he ever read any of his works. If he has he deliberately suppresses every fact put forward that was calculated to disprove his sensational sermons. We may well ask whether such things are likely to advance the interests of religion, even though we may be denounced as "infidel" and "scoffer" as was Charles Dickens when he embalmed for posterity *the Rev. Mr. Stiggens.*



No. 3.

No. 3 is from the Niagara blue building beds (limestones). Although the base is concealed it probably comes under the head *Dendrograptus*. It differs from any found here by the writer hitherto. On No. 1 slab occurs a smaller graptolite (new to me also) which has been skilfully developed by Mr. A. T. Neill.

GEOLOGICAL NOTES, ETC.

Read before the Hamilton Scientific Association, March 29th, 1901.

BY COL. C. GRANT.

"It is not faith, but the lack of it, that is displayed in those who dare not fearlessly face the search for truth, and take the consequences of investigation."—*Rev. J. Minot Savage, in The Arena.*

Sir W. Dawson seems to be so completely misunderstood even by many of his own countrymen here, that the writer may be excused for calling attention to his real views on a few disputed points among modern geologists, although it must be admitted but few shared his opinions latterly. While acquiescing with all the leading men of the age regarding the different formations, superposition of rocks, etc., as now set forth, it is not until the great Ice Age of Geikie puts in an appearance that we notice any considerable divergence from the majority of field geologists in the fight so long waged between "Glacialists" and "Iceburghists." He took his place among the latter. He may have been influenced by his environment in some degree, while studying rocks on the border of a continent. In submerged land there we may expect to find dropped boulders and other indications of icebergs when a subsequent elevation took place. It seems allowable to suppose that both glaciers and bergs were engaged in leaving their impress at the period in question. Much unnecessary discussion might have been avoided if this had been kept in view. You may remark while Sir William gives the calculations of others regarding the time which elapsed since the great Ice Age, he carefully abstains from committing himself to any view, merely stating "the date of the glacial period is at present very uncertain." He accepts the universally expressed opinion of anthropologists, archæologists, etc.,

regarding the primitive man, his use of stone and flint implements, adding to the foregoing, "It will be unnecessary to "dwell upon the characteristics of the first race of men known "to us, they were rude and uncivilized, confessedly men and "in no respect akin to apes." Where can you find here any confirmation of the belief that man once fell from a state of civilization to barbarism, and losing the knowledge acquired of metal implements and their manufacture became such utterly degenerated savages as to be only able to fashion stones, flints, etc., into weapons for war and the chase? The view thus expressed has been so completely refuted that neither on this continent, in Europe, or elsewhere can it be for a moment entertained by any individual possessing even a rudimentary acquaintance with either anthropology or geology. The tendency of the race has been upward, not downward, and when one of the most brilliant men of the age, Archbishop Whately, of Dublin, endeavored to prove that savage races are fallen descendants of more civilized people, thanks to Sir John Lubbock, Tyler and others, the defeat he met was so crushing as to compel every leading scientist in the United Kingdom to oppose the view as altogether untenable.

In a former paper I referred to discoveries in Egypt of primitive workshops containing stone and flint implements which from their positions completely disproved the assertion that such things were unknown there, that this country at least displayed from the earliest pre-historic times a high degree of civilization, and that it never had a Stone Age. A friend a short time ago forwarded an account of recent excavations in the tombs and temples of Egypt, undertaken for the British Museum by the famous archæologist, Dr. Flinders Petrie. This extract has been mislaid, but it asserted that the most convincing proof had been obtained that the Stone, Bronze and Iron Ages were unquestionably shown to have existed there, as in every other part of the old world, where the history of the human race has been properly examined by men uninfluenced by ancient traditions. The graves discovered in Upper Egypt by Dr. Morgan and others at Abydos and

Najada lately excavated contained human remains said to belong to the early and later Stone ages.

The following extract gives a description of the oldest mummy ever discovered, now in the British Museum. It is believed to have been interred 8,000 years B. C. "The body is that of a man about 5 feet 9 inches high, with a distinctly intellectual shape of skull instead of the almost ape-like head found in some of the pre-historic races. There is a single lock of fair hair left on the scalp, suggesting that the skin was fair also. It is generally accepted as one of a race decidedly superior to the ordinary African savage. The best archæologists have decided the mummy is one of the original Egyptian race that was conquered by an Asiatic invasion some time about 8000 B. C. The grave was a shallow hollow dug in the sandstone, covered with stone slabs. It was surrounded by water jars, the flints and tools. This is proof of a belief in a future existence at an early period." Yes, quite true, but how does it affect Usher's chronology embalmed in the authorized version of the Bible? Now, Sir W. Dawson, as far as I know, accepted the Noachian deluge as having taken place, but never produced any geological evidence in support of this view. He held the belief that the skeletons found in caves in Europe may have represented Palæocosmic men who lived before the flood, stating if man is so recent geologically, he may still be very old historically.

A general opinion prevails here (how derived I am unable to discover) that Sir W. Dawson was completely opposed to the views of our modern so-called scientists in everything. We are fully aware he was antagonistic to the doctrine of evolution now generally accepted; that he attributed the grooving and polishing of certain rocks to the passing over, when submerged, of icebergs shod with rocky material. The close of the Ice Age was characterized by a lower level of the land now existing. Bergs passing over the submerged portion covered by a shallow sea and grounding on it, no doubt could plane, polish and striate the rocks underlying and when the sea bottom was elevated subsequently to its present position it

may prove a very difficult matter indeed to distinguish berg from marks made by a glacier travelling landward. In Nova Scotia and the lower province you may remark in places material apparently deposited by the former, and Sir A. Geikie expressly states that erratic blocks were chiefly transported by the great ice sheet. They were partly also by floating ice during the rise of the land.

With regard to the Jewish or Babylonian account of the universal Noachian deluge, you may perceive from Sir William's numerous publications that he believed in the occurrence. We must admit the belief was generally entertained by his early contemporaries also. The writer imagines you cannot to-day find a single prominent geologist in the world willing to admit that any such catastrophe as is recorded has ever taken place. Perhaps we may discover in this instance, or in others, an explanation of the attitude taken by the eminent Canadian in the following extract from the brief biological sketch of the life of Sir William Dawson by his friend Dr. Ami of the Dominion Geological survey : "Sir William was a devoutly religious man. His private as well as his public life bore testimony to his inward faith. He sought to apply the scientific method in the interpretation of many otherwise obscure passages of Holy Writ, and by his numerous writings on this subject certainly drew attention to many points of world-wide interest." Doubtlessly he wished, like Dana, to reconcile geology and Genesis ; whether he succeeded in doing so may be questioned, but one thing is certain, he honestly believed in the correctness of his views, and assuredly ranks far above what the ex-President of Cornell University calls "The men who since their youth have learned nothing and forgotten nothing, unthinking persons of little or no importance save in making up a retrograde majority in an ecclesiastical tribunal."

Some of the most important discoveries are so recent that necessarily they must have been unknown, while others were possibly overlooked by Sir W. Dawson when he stated, "for the present therefore, man is geologically a post glacial species."

Since the writer called your attention to the fact that human remains, implements, etc., had been found associated with the bones of African animals in European caves, and even since Sir John Evans, President of the British Association for the advancement of Science, delivered his opening address at Toronto, much additional light has been thrown on prehistoric man. The outlines of the human skulls figured in the chain of life represent those of the Neolithic period. The London Morning Post of February 13th, 1900, gives us the Hunterian oration delivered by the author of the British People (N. C. Macnamara) at the Royal College of Surgeons, England. In it I find the following remarks: "From an analysis of this maximum number of anatomical characters common to man and anthropoid apes, it was proved that they were derived from the same stock." He goes on to show that the defect in the ape's skull is owing to its ossification in the first year of life into a rigid case, whereas in man the fore part does not consolidate until adult age is reached, Mr. Macnamara did not think this was always the case. The skull found in Java was clearly on the border line between man and ape, while the skulls of men living in Europe during pre-glacial and inter-glacial periods more closely resembled in form and structure the crania of the *Chimpanzee* than those of existing Europeans. Only think, gentlemen, among the many human skulls in the unrivalled collection of that college museum, the giants of old are unrepresented, what a pity it is that the eloquent Dr. Talmage does not forward for its acceptance the cranium of one who formerly attained the height, as he alleges, of twenty-three feet.

The infidel utterances of Dr. Macnamara, which passed unrebuked by Sir William MacCormac, who presided, or by any of the F. R. C. S's who tacitly acquiesced, should furnish Dr. Talmage with the opportunity of classifying the leading medical men of Great Britain with the Astronomers, Geologists and Archæologists he denounced. What an interesting subject for a sensational sermon from one in search of notoriety. The hearty speaking out you advocate in religious matters is a posi-

tive necessity in this instance, only fancy a celebrated physician who was selected to deliver "The Hunterian Oration" (one of the highest honors known to the medical profession) positively rejecting the Hebrew version of the creation of mankind, and that apparently with the concurrence of the Doctors present.

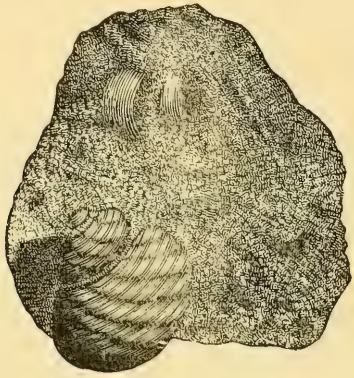
Some unsanctified geologist in the States must derive considerable amusement in stuffing the eloquent pastor of the Brooklyn Tabernacle with questionable information regarding the past history of life on earth.

The Doctor, for instance, informs us "that before the "human race came into the world the earth was occupied by "reptiles and all sorts of destructive monsters (very true, "'Dinosaurs,' 'Megalosaurs,' 'Iguanodons,' etc.) but God, "he adds, sent huge birds to clear the earth of these crea-"tures." There we have the question settled at last, no doubt to the satisfaction of the learned gentleman's admirers in Canada and the States. The extinction of the great Reptile Age, the mystery of every Palæontologist, is at length established!

Sir W. Dawson, referring to the Age of Reptiles, remarks, the imagination is taxed to conceive of a state of things in which the seas swarmed with great reptiles on every coast. When the land was trodden by colossal bipeds and quadrupeds in comparison with which our modern elephants were pigmies. Dr. Talmage would earn scientific gratitude by producing for our inspection a single bone or feather of their destroyers.

The majority of Palæontologists everywhere to-day are of opinion that birds descend from reptiles. At the international congress (zoological) held at Cambridge a short time since, which was attended by the chief scientific men in Europe, and some from America also, at the third day's proceedings I find Professor Seeley, of Columbia University, New York, began by remarking that thirty years ago birds and reptiles were united together owing to the discovery of many features in the skeletons of some fossil reptiles previously known only in birds. The meeting of this congress of zoology and physiology was recognized by the University of Cambridge as a

suitable opportunity of conferring honorary degrees on ten of its members, including Hæckel, the famous Professor of Jena University, and the London *Times* informs us that the Prince of Wales telegraphed his congratulations upon the great success of the congress. Hæckel at the meeting said he believed that the different series of placental mammals converge so nearly that they must all have been derived from one marsupial ancestor.



No. 4.

The aperture of the Gasteropod (Sea Snail) is so very indistinct that one may well hesitate to call it a *Platyceras*. It comes from Trenton Shingle, Burlington Heights, the ancient Barrier Beach. It does not resemble any species known to me. The late Mr. Billings named a specimen from the Trenton beds in the lower Province *Cyclonema Montrealensis*. It is not that I think.

GEOLOGICAL NOTES, ETC.

Read before the Hamilton Scientific Association, April 26th, 1901.

BY COL. C. C. GRANT.

> There lives more faith in honest doubt,
> Believe me than in half the creeds.
> —*Tennyson.*

The writer is perfectly aware of many opinions erroneously credited to the late Sir William Dawson, and often wonders how such false ideas regarding the eminent scientist could ever have got into circulation. In general you find in tracing up the matter either ignorance of geological affairs, or idle gossip with its usual exaggeration rather than religious prejudice may be accountable for the misrepresentation. The President of the British Association for the advancement of science (Sir John Evans) in his opening address at Toronto in 1897, stated, "The duration of the Palæolithic period must have extended over an almost incredible length of time which was sufficiently proved by the fact that valleys some miles wide, and a depth of 100 to 150 feet have been eroded since the deposit of the earliest implement bearing beds. He also referred to the European caves and the thickness of the stalagmite layers over their bone beds. Now Sir William previously was fully aware of both circumstances and in admitting the immense time for the valley erosion, he points out the excavating process may have taken place at a far distant time, that they were perhaps filled up with sand, debris, etc., even to the level of the beds on the entrance to the caves, which hold the human implements etc., there discovered. The point raised can scarcely be explained by, "If such were the case what became of the vast amount of the material removed." It is probable (if it existed) that it could have been swept away seaward by the mighty river

floods which must have followed the disappearance of the Glaciers. To the writer it indicates an absolute admission of the existence of pre glacial man in Europe, and this unquestionably would not be in accord with Sir William's opinion, that man there made an appearance at the close of the Glacial Age.

As regards the organic remains found in caves beneath Stalagmite deposits, he alleges the deposition of the material varies, a slow deposit now may be represented by a more rapid rate formerly ; and Dawkins ascertained a quarter of an inch per annum was the average in some of the caves in England and this, if such were the case, would prove far more recent occupation than was supposed heretofore, and for which a fabulous antiquity was claimed. On the other hand, Sir John Evans in his Toronto address points out that it is uncertain, whether any of the river-drift specimens belong to so late a date as the cavern remains at Creswell-Crags, Derbyshire ; but the greatly superior antiquity of even these to any Neolithic relics is testified by the thick layer of stalagmite which had been deposited in Kent's Cavern before its occupation by men of the Neolithic and Bronze periods. He adds as regards the implements of Palæolithic time stone weapons and of that long troglodytic phase of man's history, not a single example with the edge sharpened by grinding has as yet been found. Separated from these earlier remains by a stalagmite layer in the caves mentioned above you will find flint hatchets polished at the edge and on surface, cutting at the broad not narrow edge.

The advanced school of Geologists fails to recognize its obligation to the eminent Canadian in opposing Archbishop Whately's views : when asserting that all imperfectly civilized barbarous and savage races are but fallen descendants of races now civilized, this opinion was almost universally entertained formerly, and certainly has not died out in Canada yet. Here the entertaining parties are chiefly represented by a few old people, a class unwilling to give up early impressions however erroneous, or by churchmen so wedded to ancient tradition and blinded by religious prejudice as to imagine churches may yet

have sufficient influence to arrest the progress of that *false* scientific teaching existing in public schools and universities at present.

A short time since the writer called the attention of the section to the discovery in Egypt of large numbers of stone and other implements which clearly proved how mistaken the good people were who asserted such a thing as a Stone Age was utterly unknown then.

This is proved to be untenable by American, German and British Archæologists who were excavating far apart. If any additional evidence was required to show that in the far off days the inhabitants of that highly civilized region were unacquainted with metals, the extract from the report of the French explorer seems sufficient to convince the most sceptical on the point. The French Government has published the first volume of the Memoirs of Jacques de Morgan which deals with his explorations for the site of the city of Susa. Mr. de Morgan ran a series of tunnels into the mound at various levels and found traces of five distinct settlements. One of these he found to be the site of the Greco-Parthian City from 200 to 300 B. C., beneath, the Persian which existed between 300 to 500 B. C., and below this, the older city which was destroyed in 640 B.C. In this, was obtained a cylinder of Nebuchadnezzar the Great. The Memoirs go to show brick records of the Cassite rulers, this city dates probably from 1800 B. C., when they conquered Babylon, inscriptions of a much older date in one chamber, the most important of which was a fine stile of Naram-Sin, son of Sargon, who reigned 3880 B. C.

Further down, Mr. de Morgan found traces of a wooden city, which had been destroyed by fire, this contained stone Maces, a flint sickle and a hand made pottery, no metal, no inscriptions. Still lower, thirty feet above the virgin soil, there was found an older settlement containing rude flint implements and pottery. The date of these two primitive settlements Mr. de Morgan is unable to determine, and the term regarding the flint implements is too vague to enable us to ascertain whether the discoverer intended to convey the impression that they belonged to a Palæolithic not a Neolithic period.

Anyway the discovery of the French exploring party furnishes additional evidence of the correctness of Sir W. Dawson's views regarding primitive man, and we must not forget he arrived at the conclusion long before the recent discoveries of Flinders Petrie and others in Egypt.

But what effect will finding the cylinder of Nebuchadnezzar have on the traditionalists? That may be easily foreseen; what has repeatedly happened will occur once more; they will point triumphantly to this single circumstance as convincing proof of the undoubted historical accuracy of the Hebrew writers, while pretending not to perceive anything else of the slightest interest in the remaining part of the find. As a matter of course the stone implements and their position would be ignored altogether. Suppressing facts seems worse to me than open lies. Not long since the writer learned that the Rev. Dr. Talmage preached a sermon on witches, at Washington. Having obtained a report of it from a Toronto paper, on examination I found as I anticipated, much had been suppressed. The Doctor states, "under the form of a belief in witchcraft, their delusion swept the continent. So mighty was it that it included among its victims some of the greatest intellects of the time, the Chief Justice M. Hale, Sir Edward Coke, Cotton Mather, Richard Baxter, Archbishop Cranmer, Martin Luther. In the sixteenth century, in Geneva, 1,500 were burned to death as witches; in one part of France 1,000 were burned." Now here I notice a highly important omission on Dr. Talmage's part. Why does he not give the number executed as witches in Great Britain during the Commonwealth, viz., 3,000 according to English authorities. He may think it an act of indiscretion to expose the fanatical bigotry of Puritanism, and note how carefully he avoids informing his hearers that the ancient Hebrew traditions and their baleful influence led to the cruelties in question. A leading English scientist, Sir John Lubbock (recently raised to the Peerage), informs us, "I have elsewhere endeavored to show the purifying and ennobling influence of science upon religion, how it has assisted, if indeed it may not claim the main share in

sweeping away the dark superstitions, the degrading belief in sorcery and witchcraft, and the cruel intolerance which embittered the Christian world almost from the very days of the apostles themselves. In this she has surely performed no mean service to religion itself." The nineteenth century will be known in history as the scientific one, says the *London Graphic*. It was then science shook itself free of superstition, prejudice and false principles and established itself as a power. Theology every year falling into greater disrepute (witness your empty churches) must adjust itself to the new conditions revealed by scientific research. The church is fast loosing its hold on the younger, more intelligent members of the community. "It is not the scepticism which questions, but the scepticism which denies that is deadening to faith," remarks Professor Barnes.

We have the conception of a creed and scripture which came from the Middle Ages, on the other hand a conception of science which comes from modern life. "The story of the deluge is not confined to the Bible narrative," adds President Harper," "it is found in the literature of twenty nations. There is no evidence to show that the narrative in Genesis is any more authentic than the others. It is likely that all the stories came from the same source, handed down through generations by word of mouth."

"There is no real ground for conflict between religion and science," remarks a Professor of the Chicago University. "The conflict is due to the false claims for the Bible set up by its adherents. Moses merely records the current tradition of his time." Professor Goodspeed explains in the conference that the action of Joshua (directing the sun to stand still) was not to be taken literally, but only as representing Joshua in a fit of poetic inspiration calling upon the powers of nature to aid him in the contest with the enemies of the Lord's people, and in reply to a question regarding the story of Jonah, the Professor declared that no man was constrained to believe such a tale as a necessary part of his Christian education. "The fact that Christ mentioned the miracle does not prove its truth.

He frequently drew illustrations from the Hebrew Scriptures because familiar to his hearers."

What is known as the higher criticism has undoubtedly established itself in the chief universities both in Europe and America. Progressive churches (as you may perceive) are fast acquiring similar views.

THE LATE JUDGE LOGIE.

BIOLOGICAL SECTION.

REPORT FOR 1900-01.

The Section has little or nothing to report in the way of actual work done during the past Session.

Since the last report there has been added to the Herbarium of the Section, the collection of the plants made by the late Judge Logie. This collection has been donated to the Association through the kindness of the family of the late Judge and our good friend Dr. Reynolds, to whom the Section is deeply grateful.

Judge Logie took a great interest in the work of the Association and especially in the subjects coming under the attention of the Biological Section. He was not only an enthusiastic botanist but was also deeply interested in everything connected with Horticulture. He was the second President of the Association after its re-organization in 1870, to bring about which he earnestly laboured. He contributed several interesting papers which were read before the Association, among others might be mentioned one entitled "Notes on Ginseng," and another on "The Botany of California and the Territories Lying to the West of the Rocky Mountains," also "The Flora of Hamilton," a list of plants found growing in the neighborhood of Hamilton during the years 1859-61, including plants collected by Miss Kate Crooks, and published in the *Annals of the Botanical Society of Canada.*

We still have a vivid recollection of the genial warm-hearted manner in which he entered into the discussion of the subjects coming before the meetings. A very pleasant memory also remains of being appointed a colleague of his to examine the botany of the Ravine near Grimsby on the occasion of an Association "Field day" at that place in 1872. It seems

therefore very fitting that we should be the custodians of his collection of botanical specimens now reported.

While an exhaustive examination of the specimens has not been made, it may be stated, that it contains many plants now probably extinct in this section, and several not reported from any other Canadian locality. Among those of greatest interest may be mentioned

Erigenia bulbosa, Nutt.
Pterospora Andromedea, Nutt.
Ledum palustre, L.
Primula Mistassinica, Michx.
Hypericum Kalmianum, L.
Sicyos angulatus, L.
Conopholis Americana, Wallroth.
Lathyrus Pratensis, L.
Azolla Caroliniana, Wellch.
Erodium Cicutarium, L'Her, taken in Princess Square, Hamilton.

A beautiful little specimen marked "Flowering Moss, Long Point," probably represents the first authentic collection in Canada of Phlox Subulata, L.

The occurrence of some of the above mentioned plants in Ontario has been questioned, but examination of the specimens dispels any doubt.

A. Alexander,
Chairman.

J. M. Dickson,
Secretary.

NATURAL HISTORY NOTES.

Read before the Hamilton Scientific Association, April 5th, 1901.

BY WM. YATES, ESQ.

HATCHLEY, January 29th, 1901

However obscure and difficult it may be to ascertain the immediate changes of temperature, and however slight the power of prognosticating impending weather changes, a few assumptions that have been got at by a perusal of carefully-made records of precipitation, and temperatures experienced in southern Ontario during a period of fifty-five years and more, have led to a few conclusions that are believed to be trustworthy.

One of these, which is almost received as an axiom, is that in this zone there is never more than three of the winter months in which the temperature remains steadily below the freezing point. It has been noticed during the period indicated above that if December is severe with ample snow-fall one of the succeeding three months is likely to be a mild and open one and the period of good sleighing has not been known in our time to be of longer than three months' duration. The old pioneers aver that there is always a "hollow place" of a month or so during our customary four months in which plow work is impossible. The clearing away of the forests as well as the draining of eight-tenths of the swampy areas would be thought to have an appreciable effect on the provincial climate; the severity and the old time frequency of summer-night frosts seem to have been much mitigated; also with very rare exceptions the autumnal months, especially that of October, have been of higher average temperature than was experienced a few decades ago in our past history. In the now drained and cultivated swamp lands the sun's rays penetrate the earth during

the day and radiate warmth to the atmosphere and so modify the nocturnal June chills that were forty or fifty years ago disastrous in frequency to fruit blossoms as well as to the staple crops of the country.

This fact is shown beyond a peradventure during occasional partial night-frosts in early June when the growing vegetation is always most severely blighted in the lowest parts of the bog, and where the superabundant moisture may have been insufficiently expelled; yet, despite all human prudence and diligence, each returning season seems specialized by some trait or characteristic that is beyond the scope of human effort to antagonize or foresee. The emphasis of productiveness is laid some years on one section of the gifts of Ceres or of Pomona and another receives only a stinted share of the celestial bounty and exuberance. There really seems in this contention with the elements to be as great a stimulus to the mental and corporal energies as is to be found in any avocation of life ; exigencies are of continual occurrence; "to make hay while the sun shines" is an ancient aphorism, and one of our neighbors was heard to say one year when he happened not to put in a wheat crop, "when it rains pies my dish always happens to be bottom upwards," like the foolish virgins whose lamps were untrimmed.

A few years ago only one farmer in this district saved his apple crop by gathering the fruit at least a month in advance of his neighbors' efforts in the same line. He, at the time of his plucking the fruit, was ridiculed on account of the alleged unripeness of his seek-no-furthers and his russets. Winter set in abnormally and the man's timeliness enabled him to pay back the ridicule with interest. Another year his good fortune would have had a certain admixture of loss and injudiciousness.

Foreknowledge or shrewd guessing of coming is thought by farm folk to be conducive to profit and auguries are watched for in the doings and the plannings of the wild or the tame animals. The Mother Porker, it is averred, can see what's in the wind and promptly acts in comformity to the warnings. The common assumption that a very small amount of literary train-

ing and that a minimum intellectual equipment is appropriate to the business of a tiller of the soil has always seemed to the writer of these lines to be a strange hallucination, though perhaps occasionally countenanced by those engaged in that calling as implied in their cynical use of the term "Book Farming." There are as strong incentives to mental culture in the every-day life of the ploughman as may be found in fulfilling the duties of the commercialist or of the artizan.

It is the farmer's part to create, and all trade rests on his primitive activity. He is a converter of the elements into food substance, so there must be less of envious rivalry in the work of chaining the sunshine and breeze. Yet in dealing with the tangled instabilities of the ever-varying seasons he has need of "all the crafty vigilance of the petty shop keeper." It is to his material interest to be studious of the climatic conditions,

"The strange varieties of chance and the mystic seasons' dance"

and while one would not wish to condemn the discussions indulged in at the usual meetings of the Farmers' Institutes the assumption seems to be that the stuff to be produced is of far more importance than the producer.

"Yet the oracles tell us,
One harvest from the field
Homeward brought the oxen strong;
Another crop the acres yield
Which I gather in a song."

We may perhaps advantageously watch what is written on the sibylline leaves of the meteorological conditions, try to detect the size and pace of the flowing waves of benefit or of obstruction. There is fate and gravitation to be dealt with, to bend and to conform to as well as to utilize. Some one of nature's bounties has "its innings" every season. We make preparations to gather carefully the flow of maple sap. Some years the aerial changes are unpropitious to that industry. In others, despite our preparations and pre-arrangements, the flow will be so violent and continuous (pouring forth night and day for a week at a time) that there is serious unavoidable loss. Some seasons there is a

bonanza in clover seed, or in the potato crop. Another year (if atmospheric conditions are favorable in May) the exuberance comes to the hay crop. But the emphatic prodigality of gifts rarely extends all round the circle. The bee-keepers at times complain of a honey famine, then follows a glut, the bounty is always present or on its way but comes as a surprise, so that the successful peasant is always a possibility, but not unfrequently "fails to get there." The poets have outlined the ideal farmer (landlord) as Endymion (sometimes Sir Guy):

It seemed his genius discreet
Worked on the maker's own receipt,
And made each tide and element
Stewards of stipend and of rent,
So that the common waters fell
As costly wine into his well.
He had so sped his wise affairs
That he caught nature in his snares.
Early or late the falling rain
Arrived in time to swell his grain.
Stream could not so perversely wind
But corn of Guy's was there to grind.
The siroc found it on its way
To speed his sails, to dry his hay;
And the world's sun seemed but to rise
To drudge all day for Guy the wise,
And all the hours of the year
With their own harvest honored were.
There was no frost but welcome came,
Nor freshet, nor midsummer flame;
Belonged to wind the toil
And venture and to Guy the oil.

Guy simply learned to understand the Law and conformed there-to.

HATCHLEY, March 29th, 1901.

Until about the 15th January, the winter was considered mild in temperature. After that date steady winter weather ruled in these parts. December on the whole was a mild winter month, and in southern exposure a few dandelion flowers were noticeable as late as the 21st of that month, and flowers of the blue fringed gentian were gathered by an acquaintance of the present writer, not far from here; wild, blue and yellow violets were also noticed in blossom on the borders of our woods

at a date when the days were nearly of the shortest, and it was noticed by many that the low mallow plants so common about garden fences, flowered in perfection at a date several weeks later than in average autumn seasons. Parties of the white-billed sparrow (junco hyemalis) hovered about sheltered corners of our orchards until numerous large flocks of snow buntings had begun their winter visits—in fact, the unusually large numbers and almost continued presence of the snow buntings has been one of the marked features of the winter, now nearly ended. These winter migrants from northern regions frequented this neighborhood until the 16th of March, and about the last days of January small parties of shore larks were usually seen hovering on the flanks of the more multitudinous flocks of their white feathered confreres; the shore larks are frequently seen on the well tracked highways where horse teams were frequent passers by—the bunting more habitually spreading over the snow-covered fields, and alighting wherever the dried stems of various tall weeds held out any prospect of food in their seed capsules or frost-nipped calyxes; the shore larks kept alongside or else in the rear of the hosts of buntings, showing plainly that the instinct was to be with them but not of them, a partnership with a "limited" affinity clause. A small number of Meadow larks (alauda magna) have managed to live through the winter in this locality (surmised to be late summer broods); these were noticed on almost all moderately fine days and frequented the vicinities of hay-stacks and shrubby thickets where the force and vigor of the wintry winds was likely to be mitigated; their plaintive refrains were heard from time to time when brief hours of weak sunshine gave a hint of more propitious days that the future might have in store, and upon the arrival of the bluebirds and robins on the 18th of March, the meadow larks and also an occasional tuneful song-sparrow contributed their quota to the reviving strains of vernal gladness.

A few adventurous semi-aquatic birds, such as herons, snipes and the earliest of the plovers (the killdeers) were quite

in evidence as soon as the ice had partly melted in low-lying pools and runlets ; the herons made circling flights around the lofty tree tops whereon could be seen the dilapidated remains of a few of their twig-woven nests of bygone seasons; the hereditary nest sites of this class of native birds are being rapidly destroyed by the operation of firewood cutters and employees in our local lumber camp. These ornithic waders, as well as hosts of the small warblers and several species of the most melodious thrushes, have become much rarer than they were twelve or fifteen years ago. The hermit thrush and Wilson's thrush have already ceased to cheer us with their melodious notes, unless we choose to take a walk of a mile or two to such scanty wild forest nooks as have not yet been much invaded by the woodman's levelling efforts.

However there is some compensation provided in the ornithic changes resulting from the land being devoted to the production of cereals and the various productions of orchards.

The advent of the vast number of "Bob-o-links"—the multiplication of Orioles—varieties of finches, wrens, larks and the fruit-loving wax-wing—chatterers and the warbling vireos have filled up the vacancy that would have been so noticeable by the absence of the songsters so adapted to the primitive woodlands. The total extinguishment of the wild pigeons is a remarkable instance of the dependency of certain forms of life on external conditions independent of climatic changes ; also the much earlier annihilation of the wild turkey so common in the beech and maple woods of the pioneer times is an interesting chapter of bird history There have been heard just lately (March 27th) many expressions of gladness at the punctual arrival of song birds, attendant on the recent mitigation of the cold in our atmosphere; the warm wave that reached this locality on the 17th inst. prompted arrival at daybreak on the 18th in our groves and orchards of considerable numbers of the spring blue birds, song sparrows, and the portly migratory robin; a few of the pewit flycatchers also showed themselves in the house verandas and the grackle tribe were just as eager as the last mentioned to make good their presence in their last

year's haunts. The instinct to move north must have been an extremely powerful one in the breasts of the feathered hosts, for in these districts the dissolving of the wintry accumulations of ice and snow had only made a feeble beginning, yet for a hundred miles or more to the east, west and south of us observers reported the arrival of the feathered heralds of spring at nearly the same hour. "Onward, onward," seemed the determined purpose and vocal burden. Lake Erie must have been crossed on the swell of the warm atmospheric wave during the night of the 17th, as the thawing temperature only set in here just before noon on the 17th (March) and an observer at or near Delhi in Norfolk county assures us that the song of the blithe blue birds were the gladsome greetings at sunrise, 18th of March, which was simultaneous with the like phenomena in Burford, and also within a many mile radius of where we now write. The screams of large hawks circling in mid-air were obvious on the 26th of March, and on that same day the first faint piping of the hyla (swamp frog) was heard by several local observers. Although the larks are usually considered insectivorous birds, the appellation cannot be strictly applicable and the fact of the North American large species being able to exist in a number of instances through the severities of a Canadian winter is a sufficient evidence that a variety of grass and other seeds form during the frigid months the main food supply and it well established that the seeds of the very widely distributed dandelion plant are even in summer time eaten with avidity by the lark class of birds. The seeds of *poa pratensis*, panicum crus galli and setaria glauca are abundant in the litter of stock stack yards where these hardy birds pass the winter season; the prairie or shore larks also frequent the cattle runs during the winter, and the debris to be found in such places forms food supply of crows, grackles, jays until the warmer season arrives to bring into activity the insect tribes. There have been scarcely any displays of the aurora borealis observed here during the past winter, only one illumination from that source was spoken of during the month of January, and that only of a few hours duration, but the northern aurora may yet

visit our part of the celestial vault as the phenomenon is recorded as being of most frequent occurrence in these latitudes shortly before or after the period of the vernal and autumnal equinoxes. There were, however, during the past winter numerous occurrences of the parhelia or mock suns during the month of February. These are usually noticeable in clear cold weather when the sun is only a few degrees above the horizon, either in morning or evening, and are popularly associated in the minds of our farmers as indications and accompaniments of extreme cold; the luminous spots, termed "sun dogs," are faintly tinted with the prismatic colours, and are by many thought to be caused by the sun's rays being reflected at a particular angle from numerous particles of snow above the usual cloud altitudes in our atmosphere. These mock suns certainly were seen with most frequency during the mornings and evenings of the zero temperatures of the month of February.

A neighbor boy a few days ago brought to me a screech owl, that he said he just killed as the tyrant raptore was feeding on the body of a pet pigeon; the boy said that three or four of the pigeons had been previously victimized this winter by the same owl or by its confreres. The screecher was plump in condition and in the perfection of plumage, back or all upper parts of a bright reddish brown tinge, breast and under parts symetrically barred with greyish brown and white. The sheltering rendezvous of the screech owl's family party was hunted for and discovered in a hollow tree trunk on the bush portion of the farm; the pigeons were sheltered in the barn belonging to the boy's father

Last autumn the handsome variety of grey squirrels were observed to be more numerous in our sugar bushes hereabout than for many years past, but unfortunately these interesting tree climbers were unsparingly persecuted to death by amateur shooters to the annihilation point, and there seems to be no effectual means of putting an end to these regretable practices.

CHURCH ARCHITECTURE IN NORTHERN FRANCE

ABSTRACT OF A LECTURE

Delivered before the Hamilton Scientific Association, by Professor John Squair, March 21st, 1901.

(ILLUSTRATED BY LANTERN PROJECTIONS.)

We shall disregard many interesting relations of architecture to mathematics, æsthetics, etc., and consider it mainly in its relations to the ideas and tendencies of the different centuries of which we shall treat, particularly of the time subsequent to the Renaissance.

The art of France in the Middle Ages is one of great richness and variety. All the forms of literature flourished: epic poetry, lyric poetry, the drama and history. Sculpture was carried to a high state of excellence. But the architecture of the period is the richest form of artistic legacy bequeathed to modern times. An attempt has been made in the nineteenth century to revive an interest in mediæval literature and many beautiful things have been brought to our notice which were overlooked by the men of the seventeenth and eighteenth centuries. Scholars and critics have republished and expounded and sometimes modernised the great epics and dramas of the Middle Ages, but it is doubtful whether any permanent vogue regarding these works will ever be re-established. Some of great patriotic value such as the Chanson de Roland, or some of the beautiful lyrics appeal strongly to men of our time and will not be forgotten, but the number of ancient poems secured from oblivion will be small. Quite otherwise is it with architecture. Here all the samples of mediæval art which remain are regarded with the greatest favour. The contempt which

was heaped upon them by men of classical taste has been forgotten and they have become models for the architects of to-day.

Church architecture in France in the Middle Ages is represented by two great types, the Romanesque and the Gothic. Notre-Dame de Poitiers, of the end of the eleventh century, is a sample of the Romanesque style. It is an oblong building of a type developed from the Roman basilica. Its nave and transept form a cross, its arches are round, its walls are relatively to the Gothic, low, and the flying-buttresses are absent. From the Romanesque style was developed the Gothic. The same cruciform ground-plan is at the basis of both, but the Gothic takes an enormous flight upward. The nave becomes high, to support which the flying-buttresses, so characteristic of the Gothic style, are developed. The facade undergoes changes, the great towers become a striking feature. Beautiful details like the rose-window and the delicate arcades are invented. The pointed arch gives also opportunities for richer sculptural displays. In the Gothic church mediæval architecture reached its climax. The great cathedrals of Paris, Reims, Amiens, etc. have never been surpassed by other buildings in point of beauty. The thirteenth century is the period of highest excellence, but the style was continued for a century or two later.

In the fifteenth and sixteenth centuries the new movements to which the name of the Renaissance is given led men to consider more closely the art of Grecian and Roman antiquity. The result in architecture was that they began to show contempt for Gothic style and to introduce features drawn from the styles of Greece and Rome. In the facade of Saint-Etienne du Mont, of the beginning of the sixteenth century, we see this mingling of the styles, as also in the apse and nave of Saint-Eustache of Paris. After the completion of St. Peter's at Rome it became the fashion for a couple of centuries or more to build churches of a domical structure, like St. Peter's. Such are the churches of the Sorbonne, the Invalides, the Pantheon of Paris and many others. The Grecian colonnade and pediment coupled with the Roman dome are the striking

features of the churches throughout the period known as the Classical in literature. The very word Gothic became a synonym for barbarous. Nothing was in good taste that was not of Grecian origin. This is one of the most striking phenomena in the history of art. The men of the Renaissance did not cast aside the Gothic style and adopt the Classical because the latter was intrinsically more artistic. Indeed, it is doubtful if it was so. They really rejected the Gothic and adopted the Classical because, under the charm of the superior Classical philosophy and poetry, they rejected their own mediæval literature and, along with it, what was no part of it, their mediæval architecture.

The Church of the Madeleine of the year 1807 represents a new phase of development. It is true that it was intended by Napoleon not as a Christian church but as a temple of glory, and so could be fashioned more appropriately after the model of a pagan edifice. But that is not the only reason for it being an almost exact copy of a Grecian temple. It is easy to see by comparing, for instance, Saint-Etienne du Mont (1517) with the Pantheon (1764) that originality of design was waning. The Madeleine marks the close of the eras of invention and the beginning of the era of imitation. It is a far cry from the free spirit of inventiveness which produced a facade like that of Reims to the spirit of imitation which produced the colonnade, however beautiful, of the Madeleine. The nineteenth century is the age when men are more anxious to secure historical accuracy than to invent bold, striking novelties. The field from which to choose models has been very much widened, however, since the Romantic movement of 1830. Hugo and his contemporaries turned their attention to mediæval architecture and rediscovered, so to speak, the Gothic cathedral. That graceful form became again an object of admiration, and architects took it as a model for modern structures. But Romanesque and Classical models are not excluded. In fact, nearly all types of buildings are copied in our time. The two great characteristics of modern French churches are variety of style and, what may seem paradoxical, lack of originality.

CURATOR'S REPORT.

I have nothing particular to add since my last report other than the removal by Mrs. Carry of her collection which she had loaned to the Association, she having granted the same to the Dundurn collection. To enable her to do this she was granted by the Board the loan of the cases and tables which were provided by our Association for their reception while in our charge. These are promised to be shortly returned; and when so returned they will afford our much needed space in which to classify and name our original and now much overcrowded collection. The school boys have availed themselves very freely of their Saturday afternoon admission—beside many others.

ALEX. GAVILLER,
Curator.

REPORT OF

PHOTOGRAPHIC SECTION.

During the year there has been a fair attendance of members at our meetings, perhaps better than for some years, but still there is room for improvement. It would be well for the Program Committee to arrange further ahead and let a regular monthly notice be sent to every member giving everyone due notice of the meetings.

It was decided in June to join the American Lantern Slide Interchange, and in October our set was made up and sent on to New York for criticism. One hundred slides were sent and forty-six out of these were chosen and sent the rounds of the interchange in company with Toronto slides. It might be well to call attention to the fact that while the Camera Club does not appear to be different in this respect from the other Clubs, judging from the appearances of the sets received, our interchange slides are not representative enough of all the work of the Club. This year slides were received from only fourteen members, over half of the hundred being contributed by four members alone. Some attention should be given to the making of slides during the winter months and a plan laid to draw out the work from the Club members so that not only would there likely be more men contributing but the haste at the last minute to get our set ready would be avoided and thus better slides would be received. It might be well to announce early next year that a competition would be held, say in February or March, 1902, and a medal or prize presented for the best set of say four or six slides.

In the interchange this year there are represented twenty-eight Camera Clubs, making thirteen sets, of which we have

received so far four. We also sent a set of slides to Galt and another to Ottawa, and the Club made a set of slides recently to illustrate a talk on Paris and the Paris Exposition given by Mr. C. O. Dexter. Whether it may have any beneficial effect or not, if the Club decides to join the Interchange for 1902, it would be well to make a decided protest against the indefinite way in which the sets are sent to us. I do not see why it is not possible to manage the Interchange of only thirteen sets so that we might know within a reasonable time when they are likely to be here, without having to apply to Toronto at the end of each month what we are likely to get, if any, the next month.

During the year we have had several interesting and useful demonstrations in Photographic Art. One on the use of Dekka paper by the Demonstrator of the Canadian Kodak Co., another fine demonstration was given by Mr. F. O. Eager, on Carbon printing. There have also been demonstrations on enlargements, lantern slide making, artistic mounting, etc., all of which have helped along our ambitious members. But it would be well for the Club if a great many more such demonstrations could be arranged; for, on every phase of the Art, papers could be very profitably represented to the Club in various subjects, such as: "Orthochromatic Photography," "The Lens, and how it is made," "Exposure under varying circumstances," "Printing and Toning Home Portraiture," "Lantern Slides, how to make and color them." It would do any member a great deal of good to look up these subjects, even though he had no practical experience to give.

A recommendation was made last year that the Club attempt to illustrate some poem or story. Two poems were chosen for this purpose, namely, Lampman's "Heat," and Whittier's "Maud Muller," and issued in a circular form to the members, but the results have proved that probably the work undertaken, while very commendable, was a little more than the majority of the members were able to undertake. The idea is certainly one that should be kept constantly before the members, that they should have some motive in every picture and no negative be made that has not some meaning or purpose

in it. Our Photography will then rise above the commonplace and prove of real value to us. We are very pleased to state that the Spectator Printing Company, who made such a generous use of pictures and faces of the Hamilton Camera Club in their Christmas number, are now considering means to make their special paper more interesting to Amateur Photographers by establishing an annual competition and offering prizes for the best pictures.

Reference was made in last year's report to some very necessary changes which should be made in the Dark Room accomodation. The room adjoining the old dark room has been secured and fitted up with sink, water, etc., and in this room has been placed the enlarging apparatus. The Dark Room light has also been improved, electric light has been introduced and while a decided improvement has been made this year the Dark Room accomodation is far from what it should be, and there still remains much for next year's executive to bring to completion the good work. Some attention needs to be paid to the enlarging and reducing apparatus. Correspondence was entered into in regard to a new lens with the result that we were practically told we had as good a lens for the purpose as could be desired. The box itself, however, is very unsatisfactory and needs repair badly, the condensor is too small as it will not allow a satisfactory picture to be made from a negative larger than 4x5.

In the month of November we held our Annual Competition and Exhibition. Preparation had been made for this by circulars issued early in the summer to every member containing the list of prizes, and rules governing the competition. Twelve of the members sent in pictures aggregating 250 to 300 photographs, and the work submitted as stated by the judges, showed a very decided advance. A very handsome trophy was presented to the Club, and another was secured by the Club, these both to be for annual competition for the best collection of pictures in the Exhibition. There were also medals in the following classes : Marine, Genre, Portraits, Landscapes, Enlargements, and a prize for Interiors given by Mr. A. M.

Cunningham. The first trophy was awarded to F. O. Eager, the second to D. A. Souter, Genre medal to James Moodie, Portrait medal to W. C. Turnbull, Landscape medal to W. Mulvaney, Enlargement medal to C. F. Hunt, and a prize for Interiors to J. B. Bertram. The medal for Marines was withheld by the judges, the work outside of that which had already received awards in other classes, not being of sufficient merit to admit of a prize standing. It might be here mentioned also that there should be a more general representation of the whole membership work in the annual exhibition. It is perhaps due to extreme modesty on the part of members, but the sooner we get over that initial stage, the better for ourselves individually, and the Camera Section as a whole. The Club has been favorably represented in outside competition. One member received the bronze medal from the Toronto Exhibition, another the first prize in the Buffalo Express, and several members were mentioned in the Honor Roll of the same paper, and another member received the silver medal for Genre subjects from the Ottawa Exhibition.

We have added to the roll this year, twenty-nine new names, making a total now of eighty-seven members. We are sorry to mention the loss of three or four of our best Working members, who have removed from the city, and are now seeking to adorn other parts of this world with the products of their dark boxes. Success to them all in their new departments.

In conclusion, as Secretary, I beg to thank all who have helped in any way to make my share of the burden lighter for me, and ask for my successor in office the same hearty support that I have received.

Respectfully submitted,

D. A. Souter,
Secretary.

TREASURER'S STATEMENT TO 9TH MAY, 1901.

RECEIPTS.

Balance from 1900	$213 30
Government Grant	400 00
Members' subscriptions	56 00
Members of Photographic Section	52 00
Horticultural Society	10 00
	$731 30

DISBURSEMENTS.

Rent of Museum	$138 00
Rent of Dark Room	15 00
Caretaker $42 ; extra, $15	57 00
Gas account	13 00
Printing, $32.75 ; Engraving, $10.75	43 50
Journal of Proceedings	141 50
Postage and Stationery	27 00
Lectures and expenses	43 50
Grant to Photographic Section	39 00
Sundry accounts	26 05
Balance on hand	187 75
	$731 30

P. L. SCRIVEN,
Treasurer.

REPORT OF THE CORRESPONDING SECRETARY FOR THE SESSION OF 1900-1901.

To the Officers and Members of the Hamilton Association :

Your Corresponding Secretary for the year 1900-1901 begs leave to report that :

1. He has carried on the ordinary correspondence of the Association.

2. He has received and acknowledged the exchanges in accordance with the subjoined list of institutions and societies, and these various bodies have also been furnished with copies of our last annual "Journal and Proceedings."

THOMAS S. MORRIS.

LIST OF EXCHANGES.

I—AMERICA.

(1) Canada.

Astronomical and Physical Society.....Toronto.
Canadian Institute.....Toronto.
Natural History Society of Toronto.....Toronto.
Department of Agriculture.....Toronto.
Library of the University.....Toronto.
Public Library.....Toronto.
Geological Survey of Canada.....Ottawa.
Ottawa Field Naturalists' Club.....Ottawa.
Ottawa Literary and Scientific Society...Ottawa.
Royal Society of Canada.....Ottawa.
Department of Agriculture.....Ottawa.
Entomological Society.....London.
Kentville Naturalists' Club.....Kentville, N. S.
Murchison Scientific Society.....Belleville.
Natural History Society.....Montreal.
Library of McGill University.....Montreal.
Nova Scotia Institute of Natural Science.Halifax.
Literary and Historical Society of Quebec.Quebec.
L'Institut Canadien de Quebec.....Quebec.
Natural History Society of NewBrunswick.St. John.
Manitoba Historical and Scientific Society.Winnipeg.
Guelph Scientific Association.....Guelph.
Queen's University.....Kingston.
Niagara Historical Society.....Niagara.

(2) United States.

Kansas Academy of Science.....Topeka, Kan.
Kansas University Quarterly.....Lawrence, Kan.
American Academy of Arts and Sciences..Boston, Mass.
Psyche.....Cambridge, Mass.
Library of Oberlin College.....Oberlin, Ohio.

American Association for Advancement of Science ..... Salem, Mass.
Museum of Comparative Zoology ..... Cambridge, Mass.
American Dialect Society ..... Cambridge, Mass.
United States Department of Agriculture .. Washington, D. C.
Biological Society of Washington ..... Washington, D. C.
Philosophical Society of Washington .... Washington, D. C.
Smithsonian Institution ..... Washington, D. C.
United States Geological Survey ..... Washington, D. C.
American Society of Microscopists ..... Buffalo, N. Y.
Buffalo Society of Natural Sciences ..... Buffalo, N. Y.
California Acadamy of Sciences ..... San Francisco, Cal.
California State Geological Society ..... San Francisco, Cal.
Santa Barbara Society of Natural History. San Francisco, Cal.
University of California ..... Berkley, Cal.
Minnesota Academy of Natural Sciences. Minneapolis, Minn.
Academy Natural Sciences ..... Philadelphia, Pa.
Academy of Sciences ..... St. Louis, Mo.
Missouri Botanical Gardens ..... St. Louis, Mo.
American Chemical Society ..... New York City.
New York Microscopical Society ..... New York City.
The Linnean Society ..... New York City.
American Astronomical Society ..... New York City.
American Geographical Society ..... New York City.
New York Academy of Science ..... New York City.
Terry Botanical Club ..... New York City.
Central Park Menagerie ..... New York City.
American Museum of Natural History .. New York City.
Scientific Alliance ..... New York City.
Cornell Natural History Society ..... Ithaca, N. Y.
Johns Hopkins University ..... Baltimore, Md.
Kansas City Scientist ..... Kansas City, Mo.
Wisconsin Academy of Science, Arts and Letters ..... Madison, Wis.
Society of Alaskan Natural History and Ethnology ..... Sitka, Alaska.
University of Penn ..... Philadelphia, Pa.
Franklin Institute ..... Philadelphia, Pa.

Brooklyn Institute of Arts and Science...Brooklyn, N. Y.
War Department.....Washington.
Field Columbian Museum.....Chicago.
Academy of Sciences.....Chicago.
Agricultural College.....Lansing, Mich.
Colorado Scientific Society.....Denver, Col.
Museum of Natural History.....Albany, N. Y.
State Geologist.....Albany, N. Y.
Rochester Academy of Sciences.....Indianapolis, Ind.
Indiana Academy of Sciences.....Indianapolis, Ind.
Davenport Academy of Natural Sciences..Davenport, Iowa.
Pasadena Academy of Sciences.....Pasadena, Cal.
U. S. Board of Geographic Names.....Washington, D. C.
Lloyd Library.....Cincinnati, O.
Colorado College.....Colorado Springs.

(3) West Indles.

Institute of Jamaica.....Kingston, Jamaica.

(4) South America.

The Royal Agricultural and Commercial Society of British Guiana.....Georgetown.

II—EUROPE.

(1) Great Britain and Ireland.

England.

British Naturalists' Club.....Bristol.
Literary and Philosophic Society of Leeds.Leeds.
Conchological Society.....Leeds.
Royal Society.....London.
Royal Colonial Institute.....London.
Society of Science, Literature and Art ...London.
Geological Society.....London.
Manchester Geological Society.....Manchester.
Mining Association and Institute of Cornwall.....Camborne.
Cardiff Photographic Society.....Cardiff.
Owens College Conchological Society....Manchester.

Scotland.

Glasgow Geographical Society.....Glasgow.
Philosophical Society.....Glasgow.

Ireland.

Royal Irish Academy.....Dublin.
Royal Geological Society of Ireland.....Dublin.
Naturalists' Field Clnb.....Belfast.

(2) Austria-Hungary.

Anthropologische Gesellschaft.....Vienna.
K. K. Geologische Reichsanstalt.....Vienna.
Trentschin Scientific Society.....Trentschin.

(3) Belgium.

Societe Geologique de Belgique.....Liege.

(4) Denmark.

Societe Royal des Antiquaires du Nord..Copenhagen.

(5) France.

Academie Nationale des Sciences, Belles Lettres et Arts.....Bordeaux.
Academie Nationale des Sciences, Arts et Belles Lettres.....Caen.
Academie des Nationale Science, Art et Belles Lettres.....Dijon.
Societe Geologique du Nord.....Lillie.
Societe Geologique du France.....Paris.

(6) Germany.

Naturwissenschaftlicher Verein.....Bremen.
Naturwissenschaftlicher Verein.....Carlsruhe.

(7) Russia.

Comite Geologique.....St. Petersburg.
Russich-Kaiserliche Mineralogische Gesellschaft.....St. Petersburg.

III.—ASIA.

(1) India.

Asiatic Societies of Bombay and Ceylon.
Asiatic Society of Bengal.....Calcutta.
Geological Survey of India..... Calcutta.

(2) Straits Settlements.

The Straits Branch of the Royal Asiatic Society .....Singapore.

(3) Japan.

Asiatic Society of Japan.....Tokyo.

IV.—AFRICA.

(1) Cape Colony.

South African Philosophical Society.....Capetown.

V.—AUSTRALIA.

(1) Australia.

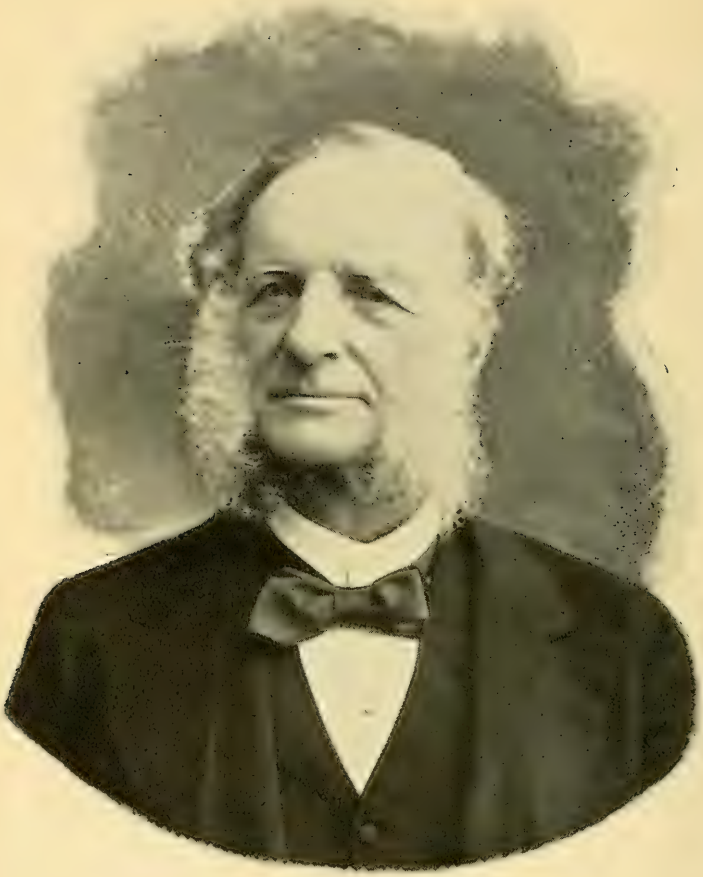
The Australian Museum.....Sydney.
Royal Society of New South Wales.....Sydney.
Linnean Society of New South Wales....Sydney.
Royal Anthropological Society of New South Wales.....Sydney.
Australian Natural History Museum....Melbourne.
Public Library of Victoria.....Melbourne
Royal Society of Queensland.....Brisbane.
Queensland Museum.....Brisbane.

(2) New Zealand.

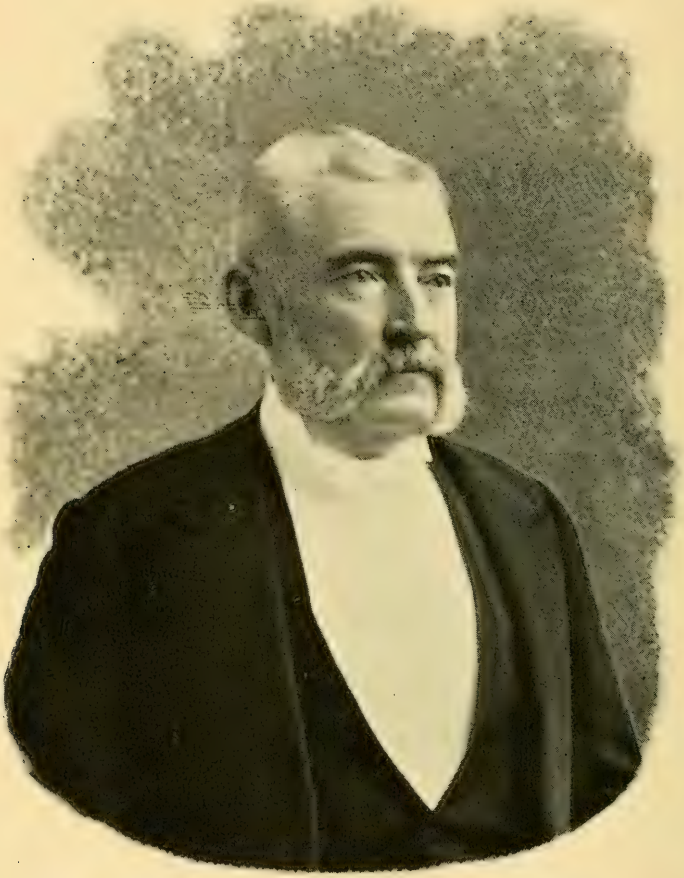
New Zealand Institute.....Wellington.

(3) Tasmania.

Royal Society of Tasmania.....Hobartown.



THE LATE J. D. MACDONALD, M. D.



THE LATE B. E. CHARLTON.

OBITUARY.

Since its last preceding annual meeting, the Hamilton Association has had taken away by death, two estimable members, Mr. B. E. CHARLTON, and J. D. MACDONALD, M. D. Appropriate resolutions deploring the loss to the Society by their taking off, were recorded in the minutes of a meeting held soon after their decease.

Mr. Charlton* and Dr. Macdonald† were for many years members of the Hamilton Association. Both took an active part in the Council which directs its procedure; and each worthily discharged, for more than one elective term of office, the duties of President of the Association. At meetings of the Society, few faces were more familiar than theirs; for both were exact, almost to punctiliousness, in their observance of duty.

A generation ago, Mr. Charlton's exploration of tumuli near Hamilton, made his name familiar to Indian archæologists: and Dr. Macdonald's presidential addresses were models of precise impartial speech, helpful to all who heard them. Both were most companionable men. Each could profit from intellectual fellowship with others; and give ungrudgingly in turn to the Association, of his own stores, leisure, intellect and heart; thereby rightfully winning a place on its bead-roll of honour.

*Born, 1835. Died, 1901.

†Born, 1819. Died, 1901.

LIST OF MEMBERS

OF THE HAMILTON ASSOCIATION.

HONORARY.

1881 Grant, Lt.-Col. C. C., Hamilton.
1882 Macoun, John, M. A., Ottawa.
1885 Fleming, Sanford, C. E., C. M. G., Ottawa.
1885 Farmer, William, C. E., New York.
1885 Small, H. B., Ottawa.
1887 Charlton, Mrs. B. E., Hamilton.
1887 Dee, Robert, M. D., New York.
1887 Keefer, Thomas C., C. E., Ottawa.
1890 Burgess, T. J. W., M. D., F. R. S. C., Montreal.
1891 Moffat, J. Alston, London.
1898 Carry, Mrs. S. E., Hamilton.
1899 Stratton, A. W., Ph. D., Lahoore, India.

CORRESPONDING.

1871 Seath, John, M. A., Toronto.
1881 Clark, Chas. K., M. D., Kingston.
1881 Spencer, J. W., B. Sc., Ph. D., F. G. S., Savannah, Ga.
1882 Lawson, A. C., M. A., California.
1884 Bull, Rev. Geo. A., M. A., Niagara Falls South.
1885 Frood, T., Sudbury.
1889 Yates, Wm., Hatchley.
1889 Kennedy, Wm., Austin, Tex.
1891 Hanham, A. W., Quebec.
1891 Woolverton, L., M. A., Grimsby.
1901 Herriman, W. C., M. D.

LIFE.

1885 Proudfoot, Hon. Wm., B. C., Toronto.

ORDINARY.

Alexander, A., F. S. Sc.
Adam, Jno.
Aylett, Fred.
Appleton, L. G.
Ballard, John F.
Berry, H. G.
Burnside, J. W.
Baker, A. H.
Bale, F. J.
Baldwin, T. O.
Barton, Geo.
Beasley, Thos.
Beasley, Mrs. Thos.
Bertram, Jas. B.
Bicknell, H. H.
Black, Geo.
Briggs, Samuel
Burkholder, J. G. Y.
Burns, J. M.
Connors, Mr.
Cunningham, A. M.
Campbell, Mrs. C. C.
Campbell, D. J.
Campbell, Robt.
Campbell, Mrs. Robt.
Clark, D., D. D. S.
Crawford, A.
Childs, W. A., M. A.
Clappison, Fred P.
Coburn, H. P.
Cochran, C. S.
Cummer, Albert
Cummings, S., M. D.
Dickson, J. M.
Eastwood, John M.
Easter, S.
Fearman, F. W.
Fearman, F. W.
Fearman, R. C.
Findlay, W. F.
Gadsby, J.
Gaviller, Alex.
Gaviller, E. A., M. D.
Gordon, John
Graham, C. O.
Grant, W. J.
Grant, A. R.
Greene, Joseph
Grossman, Julius
Hansel, Franklin, D. D. S.
Heddle, J. R.
Hedley, R. W.
Hoyle, R.
Howitt, Rev. F.
Herriman, W. C., M. D.
Holcroft, C. J.
Hore, J. G.
Hoyle, Chas.
Hunt, Fred.
Jones, C. J.
Jones, Herbert
Johnston, Geo. L., B. A.
Kemp, Geo. B.
Lancefield, R. T.
Land, J. H.
Lee, Lyman, B. A.
Lees, Geo.
Lees, W. A.
Leaney, C. A.
Leggat, Matthew

Logan, W. F.
Magee, Frank
Millard, J. W.
Mitchell, W. M
Morgan, S. A , B. A , D. Pæd.
Moodie, J. R.
Moodie, Jas.
Moodie, C. W.
Moore, H. S.
Morris, Thos S.
Mulvaney, W.
McIlwraith, Thos.
McLaren, Col Hy.
McKenzie, A. M.
McPherson, F. F , B. A.
Neill, A. T.
Nichol, C. O.
Pothier, C. A.
Pierce, Henry
Patterson, P.
Powis, A.
Reynolds, T. W., M. D.
Roach, Geo.
Robinson, W. A.
Rutherford, Geo.
Schuler, J.
Scriven, P, L.
Somerville, Wm.
Street, F. A. B.
Small, T Chas.
Souter, D. A.
Slater, James
Strathy, Stuart
Strong, Ray
Sweet, J. C.
Thompson, R. A., B. A.
Thompson, W. C.
Tolton, Stewart
Tyrrell, J. B., C. E.
Walker, A. E.
White, Wm.
White, J. T.
Wheatley, E. J.
Wilson, T.
Wilson, Wm.
Witton, H. B.
Witton, H. B., Jr., B. A.
Witton, W.
Wodell, J. E.
Whitney, H. A.
Whitton, F. H.
Young. J, M.

OFFICERS FOR 1901-1902.

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1st Vice-President.

J. M. DICKSON.

2nd Vice-President.

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Corresponding Secretary.

F. F. MACPHERSON, B. A.

Recording Secretary.

G. L. JOHNSTON, B. A.

Treasurer.

P. L. SCRIVEN.

Curator.

ALEX. GAVILLER.

Assistant Librarian.

J. SCHULER.

Council.

GEO. BLACK. J. F. BALLARD.

W. A. CHILDS, M. A.

J. H. LONG, M. A., LL.B. J. R. HEDDLE.

Auditors.

H. S. MOORE. F. HANSEL, D. D. S.